HEATING & VENTILATING

AIR CONDITIONING

CONTENTS

FOR NOVEMBER, 1936

Hotel Converts Ventilating System to Cooling	27
Automatic Air Controls for Bituminous Underfeed Stokers	29
Heating Business and Building Up Sharply Over 1935	30
Heating Business Trends	31
Degree-Days for Checking District Steam Consumption	32
Air Conditioned Smokehouse in New Meat Plant	34
Air Conditioning and Its Effect on Hay Fever	35
Ducts—Materials; Fabrication; Erection	39
Getting Down to Fundamentals—Part 17	51
U.S. Short 1,200,000 Homes, Statistician Estimates	53
Engineering Notes	54
Air Conditioning in Industry. 1—Handling of Foods	55
Advertising District Heating	58
Reference Data, 89 and 90	58
Editorials	59
Abstracts	60
News of the Month	62
New Equipment	66
Degree-Days for September, 1936	70
The Weather for September, 1936	72
Preliminary Degree-Days for October, 1936	74
With the Manufacturers	75
New Catalogs	76
Coming Events	76

For Engineers and Contractors Controlling the Design, Specification, Installation and Maintenance of Heating, Ventilating and Air Conditioning.

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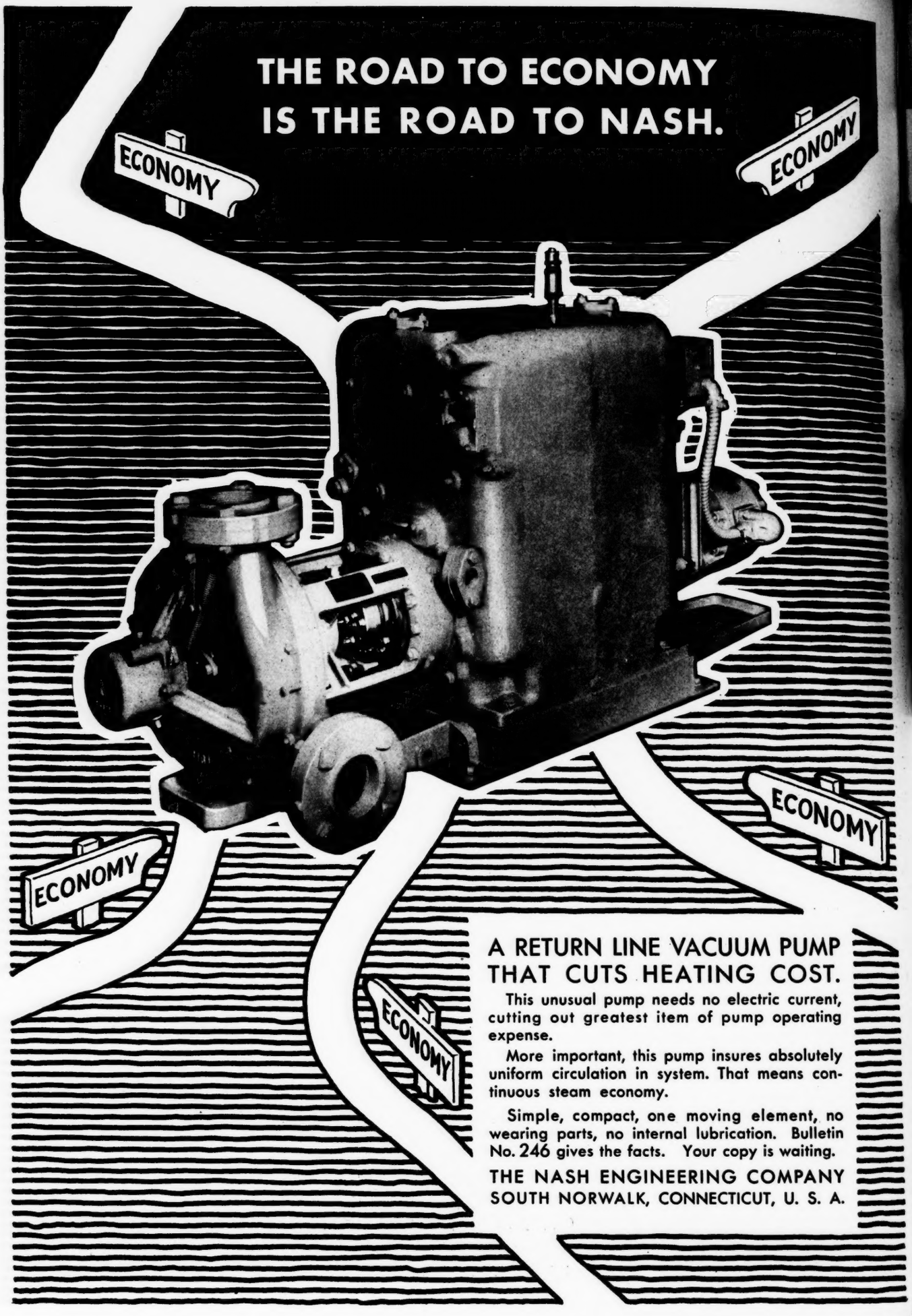

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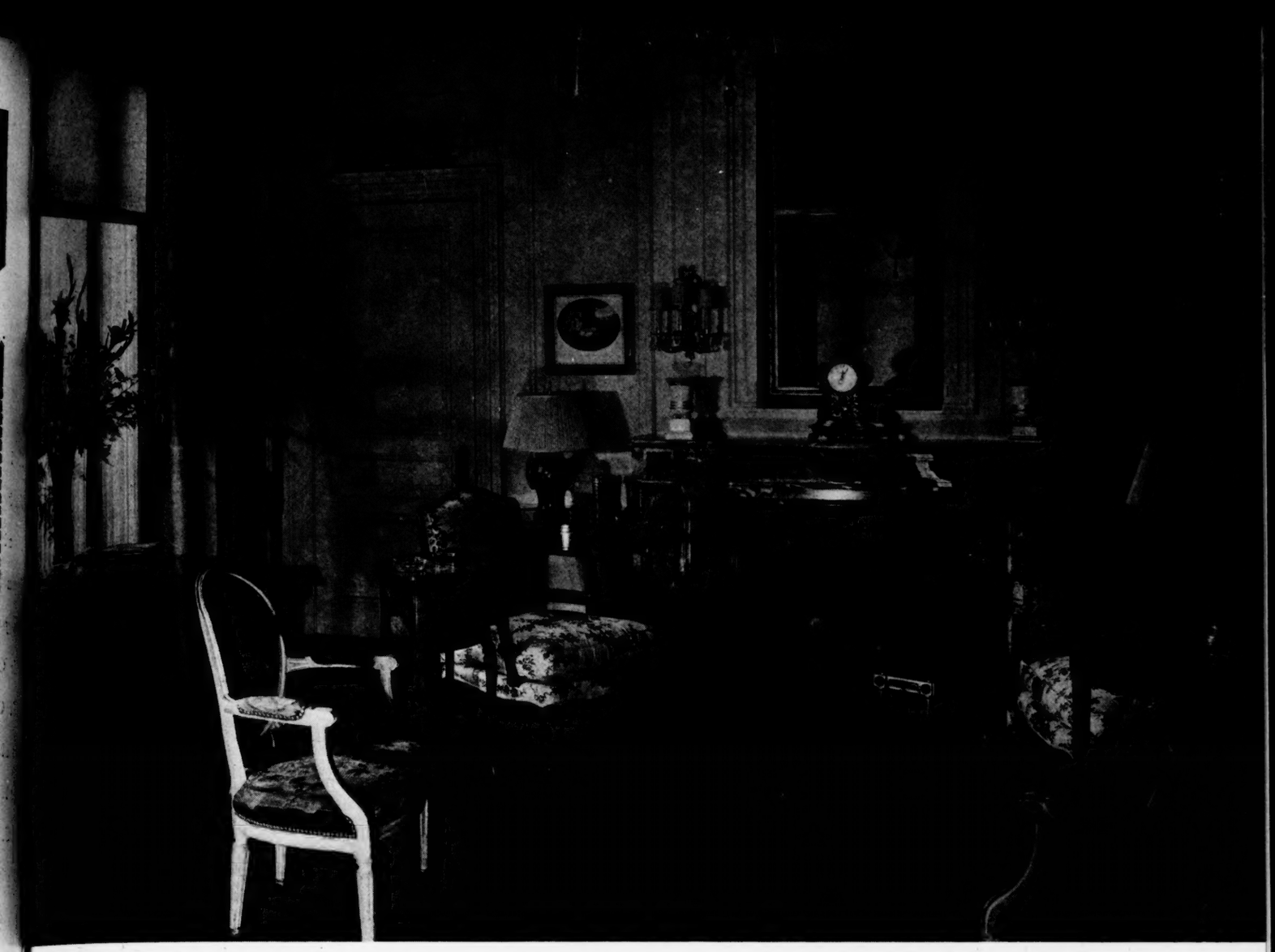


An air conditioned living room in the Hotel St. Regis. Exhaust outlet is in fireplace flue. Air inlet is over the door.

Hotel Converts Ventilating System to Cooling

INSTALLATION of air conditioning in a hotel is usually rather an expensive undertaking, particularly when the guest rooms are to be occupied during the installation period. In fact, in many cases it has been found necessary to close off a section because of the noise and dirt during the installation period.

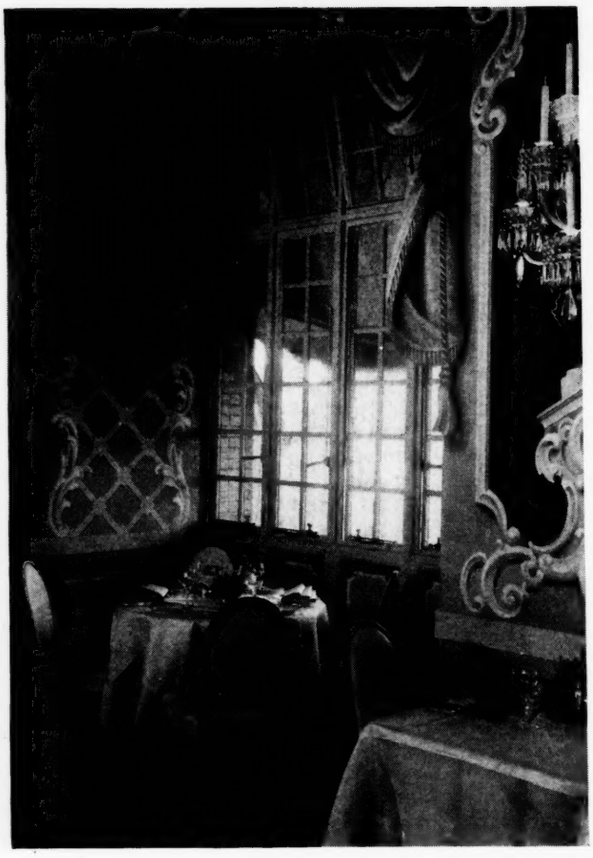
The Hotel St. Regis, which is one of New York's most fashionable hotels, was extremely fortunate in that it possessed a complete ventilating and exhaust system which supplied all of the rooms in the older section of the building. The presence of such a system made possible the installation of complete year-round conditioning with a minimum amount of disturbance.

The present Hotel St. Regis is made up of a new and an old section. The new section was built during 1927 and is heated by a two-pipe steam system, while the older section is heated by means of a forced warm air system with an individual air supply to each room. This system was provided with filters, heaters, and air humidifiers, and in reality conditioned the air during the winter and supplied ventilation air during the summer. An exhaust fan, located on the 19th floor, served to remove the air from the various guest rooms in the old section.

Because of the existence of the ventilating system and the ease of installation of air cooling in connection with such a system, it was decided to cool the old section first. Although the management quickly recognized the benefits of air conditioning when the idea was first brought forward by J. H. Ingham, the consulting engineer of the hotel, they decided that it would be best to condition only a trial section of five floors to obtain an idea of how the guests would respond. The reason that it was decided to condition a section of five floors was due to the arrangement of the supply air fan rooms. There are three of these fan rooms, each providing air for a section of five floors.

The first section was completed just before the first warm days of the summer and so great was the demand and so excellent the response that the management decided to condition a second section. This section was completed soon afterwards so that the hotel was able to offer approximately 180 air conditioned rooms to its guests during practically the entire sum-

mer. At the present time the third section of the hotel is being conditioned and it is expected that by next summer the hotel will have 270 of its rooms cooled. This number does not include the various public rooms which have been conditioned for some time. Included in this group are the Roof Garden, Oak Room. Lobby, Iridium Room, King Cole Bar, and Maisonette Russe.



Corner of the roof garden showing air inlet.

Refrigeration Equipment

Refrigerating equipment which supplies chilled water to the varous air conditioning units is located in the sub-basement of the building. Two compressors, both utilizing dichlorodifluoromethane as a refrigerant, are now employed to chill the water. The first of these, a compressor having a capacity of 22 tons, was installed a few years ago when the various public rooms in the hotel were cooled. Early this year when the management decided to condition the trial section of guest rooms a 75-ton compressor was installed. This compressor had sufficient capacity to take care of the needs of the two five-floor sections of guest rooms and also to act as a reserve for the compressor serving the public rooms. A 150-ton compressor is now being installed to take care of the additional load due to the third section of five floors and to provide some reserve capacity for the entire installation. Changes are being made in the piping arrangement so that the three compressors will be interconnected and able to take care of any changes in load.

Also located in the basement are the heat exchangers in which the warm water from the various conditioning units is chilled to the proper temperature. This chilled water is then pumped to the cooling coils in the three fan rooms and also to the conditioning units which cool the public rooms.

The fan rooms are so constructed that the air is first passed over oil type filters and then over extended surface fin type coils, through which the chilled water is passed. In these fan rooms there are also humidifiers and heating coils to provide for winter air conditioning. A 35,000 c.f.m. fan is used to force the air through the ducts to the guest rooms in the five floors which the fan room serves. Each guest room has a separate inlet and each inlet a damper which is controlled by a wall thermostat. This thermostat enables the occupant to select the temperature which is most comfortable. Return air flows back to the fan room through grilles in the door and through the halls. The system is so designed that most of the time only 20% of the air is recirculated, the other 80% being outside air. Air is removed from the rooms through individual exhaust outlets in each room, which outlet is, in a large number of cases, located in the flue in the fireplace. Ductwork carries the exhaust air to a large fan located on the 19th floor of the building where it is discharged outdoors through roof outlets.

The weather during the past summer afforded the engineers of the Hotel St. Regis an excellent opportunity to observe the operation of the system. They noted that even though the outside temperature was at times close to 100F it was possible to maintain a cooling differential of 20F. This was partially due to the excellent construction and thick walls of the old building which prevented the heat of the outside air from reaching the interior of building during the peak hours of the day.

Hotel St. Regis, New York.

It is interesting to note that in spite of the fact that air conditioning in the guest rooms of New York hotels is a relatively new feature and that people's ideas regarding the temperature to be maintained vary widely, there were no complaints by the guests about the air conditions within the rooms. This excellent record can be attributed to the fact that the system is carefully designed and operated to meet the demand of guests at all times. The individual room control has probably done much to prevent complaints and to improve the comfort of the guests.

Ferdinand Roullete is the chief engineer of the Hotel St. Regis and J. H. Ingham is the consulting engineer.

Automatic Air Controls for Bituminous Underfeed Stokers

By NOEL CUNNINGHAM

IN a recent article†, several automatic air control devices used in heating stoker operation were illustrated and described. Space did not permit describing all such devices in that article. Two additional ones are in use and their operation is described here.

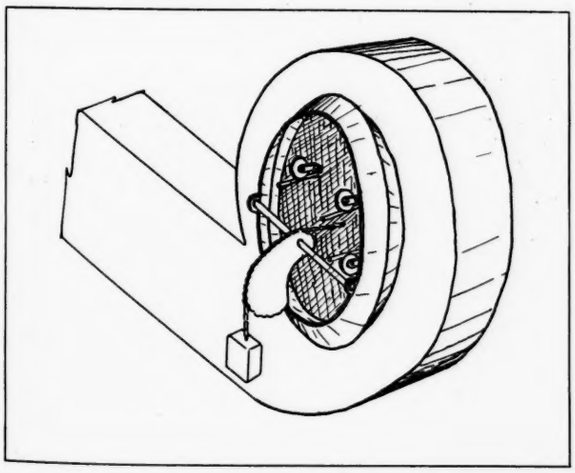
Fig. 1 shows a control which attaches to the air intake of the stoker fan. This consists of a light damper which is made to travel forward and back on a horizontal track, at each end of which it contacts a seat in the damper housing. When the stoker is inoperative the damper plate is held by its counterweight against the outer seat and closes the fan inlet against natural draft to the stoker fuel bed, thus providing a banking effect. When stoker operation resumes, the fan suction draws the damper away from the banking position and air travels around the damper plate. Depending upon the quantity of air flow, the damper assumes a position anywhere between one that allows a maximum air opening and one which practically closes the air opening.

The differential effect which controls the damper position is provided by a cam which introduces an increased moment arm as the damper approaches minimum opening. Thus, when the fuel bed develops blow holes and the fan, uncontrolled, would deliver an excess of air, the damper closes to restrict flow. When the back pressure of the fuel bed against the fan delivery increases and air delivery is insufficient, the decrease in air flow allows the damper plate to draw away from the fan, increase the area of air inlet opening, and allow a freer passage for air. The inertia of the mechanism is sufficient to prevent an air puff when the stoker starts.

Fig. 2 illustrates an arrangement which consists of a damper blade set in the air duct between the fan and the stoker burner. The damper tends to close as air passes it and a system of counterweights acts to hold the damper open. When the stoker is inoperative the damper is wide open so that there is no banking effect during inoperative stoker periods. A sheave segment attaches to the fulcrum shaft of the damper blade and over this sheave segment a flexible chain passes. The end of the flexible chain is attached to the smallest of a series of six weights which thread over the chain and each of which is supported within a casting shaped as an inverted truncated hollow stepped pyramid, the steps providing supports for weights each of which is larger than its predecessor on an ascending scale.

As the stoker comes into action the air flow from the fan causes the damper to begin to close. It picks up the smallest weight and, if the fuel bed is burned down and allows an excessive air flow, the damper continues to close, cutting down the air flow and at the same time counterweighting itself by picking up one weight after another until a balanced air damper setting is reached. Thereafter, the damper position will remain constant until some change in the back pressure from the fuel bed causes it to again reweight itself. If the depth of the fuel bed begins to increase, the air flow begins to fall off and the damper opens and drops off one or more weights until a new balance is reached. The claim for this damper is that it will automatically adjust itself by changing counterweight setting to suit any normal changes in quantity or characteristic of coal feed.

†"Air Control for Bituminous Underfeed Stokers," HEATING & VENTILATING, September, 1936.



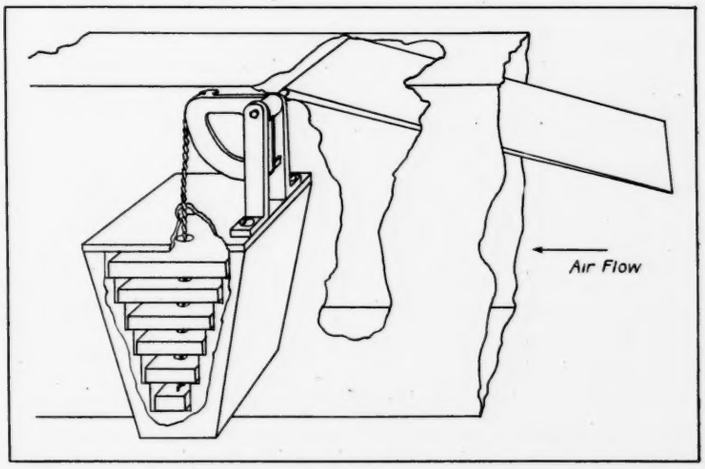


Fig. 1 (Left). An automatic air control which attaches to the air intake of the stoker fan. The control is made up of a light damper which travels forward and backward on a horizontal track. This damper closes to restrict flow whenever fuel bed develops a flow hole and the fan tends to dry an excess of air. Fig. 2 (Right). Control consists of a damper blade set in the air duct between fan and stoker burner. Damper tends to close as air passes through. When the stoker is inoperative the damper remains wide open and there is no banking effect.

Heating Business and Building Up Sharply Over 1935

HEATING & VENTILATING's Index of Heating Business Activity indicates that heating business during August was at 80.6% of 1929 levels as compared with 58.3% for August, 1935. The Index during the worst of the depression reached a low of 27.0. When corrected for seasonal variation, the index showed, however, a decline in August as compared with July, when it stood at 94.7.

The Index of Automatic Heating during August was at 154.7% of 1929 levels as compared with 102.6% for August, 1935. All of the components of this index —oil burners, gas boilers, and stokers—show declines from July after correction was made for seasonal variation.

For the first nine months of 1936 residential building totaled 23% more than was reported for the entire year 1935, and the full year 1936 promises to reach a volume three times the size for this class of building in 1933 or '34, the low points of the depression.

An index of residential building during September stood at 53.1% of 1929 levels, while the index of non-residential building was at 36.3% These figures compare with 27.6 and 24.1, respectively, for September, 1935.

Business of plumbing and heating wholesalers during September was up 40.1% over the corresponding month a year ago according to a study of business of 1176 wholesalers engaged in 21 kinds of business. The study was conducted by the National Association of Credit Men and the Bureau of Foreign and Domestic Commerce. This increase was third in the list of the different kinds of business, machinery and jewelry both having shown a higher gain than plumbing and heating.

Approximately 20,000 oil burners were sold during August as compared with 14,000 during August, 1935. Figures include boiler-burner units as well as furnace-burner units.

Central air conditioning systems installed for comfort purposes showed an increase in September as compared with August, the figures being $342,000 and $286,000, respectively. Similar systems for industrial applications showed a sharp decline from $141,000 in August to $34,000 in September. The value of refrigerants sold during September increased from somewhat less than $70,000 in August to over $94,000 in September.

The largest business in any one month since 1931, excepting only October, 1935, was shown in unit heater sales which amounted to over $773,000 in September as compared with $570,000 in August. September figures were exceeded only by sales of nearly $833,000 in October, 1935.

Sales of unit ventilators on the other hand were cut in half from August to September, figures for the latter month amounting to somewhat less than $63,000.

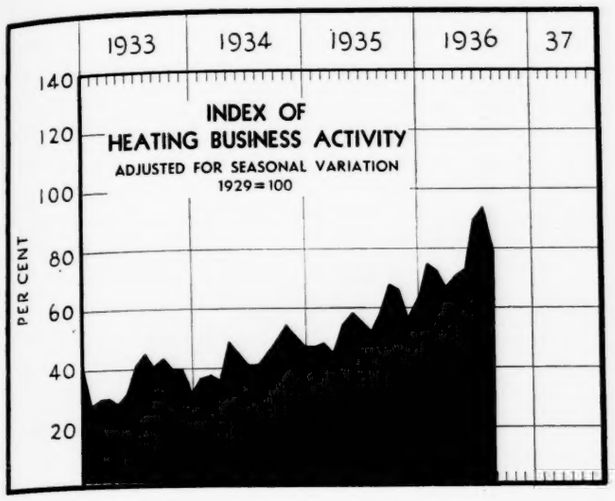
Approximately one and one-third million square feet of convectors were sold during September, of which over one-half million square feet were of the non-ferrous type. Total convector sales, however, showed a slight decline from August to September, while cast iron radiators showed their usual seasonal increase.

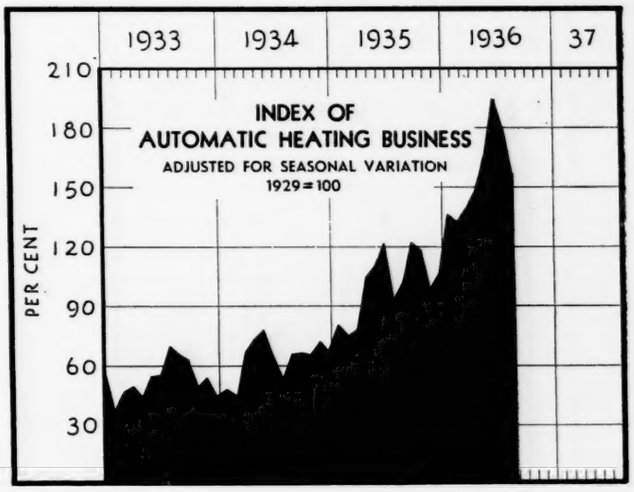
More steel boilers were sold during the month of August than in any month since October, 1930, according to recent reports. Gas boilers also are reported to be up sharply. Over 16,000 heating type stokers were sold during September, the sales of these having almost doubled from August to September and at that time showed a rise of approximately 65% from September, 1935.

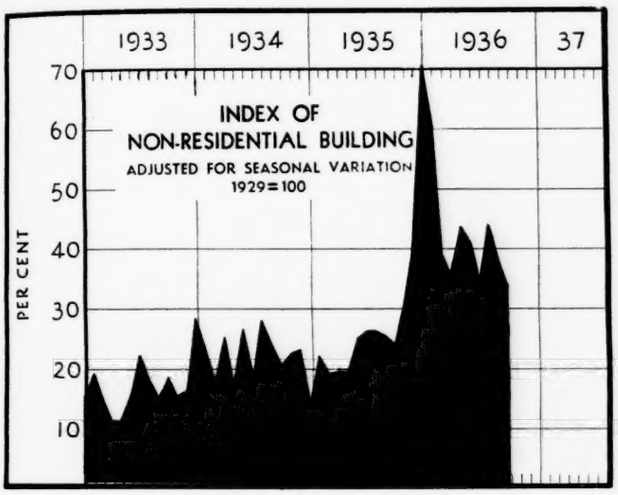
HEATING AND AIR CONDITIONING BUSINESS TRENDS

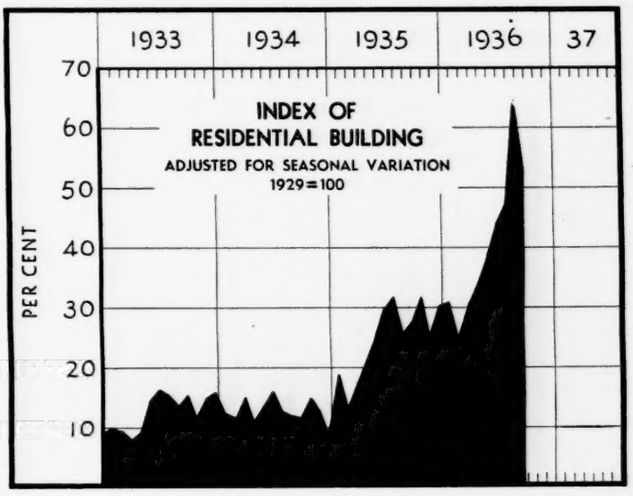
INDEXES (1929 = 100) (Seasonally Adjusted)	August, 1936	August, 1935
HEATING & VENTILATING'S Index of Heating Business	80.6	58.3
HEATING & VENTILATING'S Index of Automatic Heating	154.7	102.6
HEATING & VENTILATING'S Index of Contractor Activity	67.2	48.7
HEATING & VENTILATING'S Index of Heating Equipment Prices	81.0	75.0
INDEXES (1929 = 100) (Seasonally Adjusted)	**September, 1936**	**September, 1935**
HEATING & VENTILATING'S Index of New Non-Residential Building Contracts	33.6	24.1
HEATING & VENTILATING'S Index of New Residential Building Contracts	53.1	27.6
HEATING & VENTILATING'S Index of Stock Prices (Unadjusted)	—	50.5
HEATING & VENTILATING'S Index of General Business	92.8	79.1
HEATING & VENTILATING'S Index of Employment in Heating Equipment Manufacturing Plants	75.5	59.7
EQUIPMENT SALES	**August, 1936**	**August, 1935**
Mechanical draft oil burners, number of units	17,138	12,493
Oil burner-boiler units, number	1,556	1,143
Oil burner-furnace units, number	774	333
Blowers for public buildings, dollars	140,345	64,883
Small housed blowers, dollars	162,243	57,277
Propeller fans, dollars	332,278	128,196
Unit air conditioners, self-contained, dollars	93,502	—
Unit air conditioners, other, dollars	552,492	—
Central air conditioning systems, comfort, dollars	286,170	—
Central air conditioning systems, industrial, dollars	141,022	—
Refrigerating medium for air conditioning dollars	69,834	—
Air filters, dollars	11,531	—
Humidifiers, dollars	73,921	—
Air washers, dollars	51,916	30,320
Unit heaters, dollars	569,605	299,586
Unit ventilators, dollars	133,389	132,012
Cast iron radiators, thousand sq. ft.	7,785	6,470
Steel boilers, number	779	535
Stokers, class one, number	8,433	4,931
Stokers, class two, number	492	348
Stokers, class three, number	108	164
Indirect heating surface, non-ferrous, dollars	155,856	121,706
Indirect heating surface, cast-iron, dollars	11,896	16,035
Non-ferrous convectors, sq. ft.	554,368	317,174
Cast iron convectors, sq. ft.	754,954	423,581
Round boilers, thousand pounds	3,634	4,368
Square boilers, thousand pounds	24,658	21,689

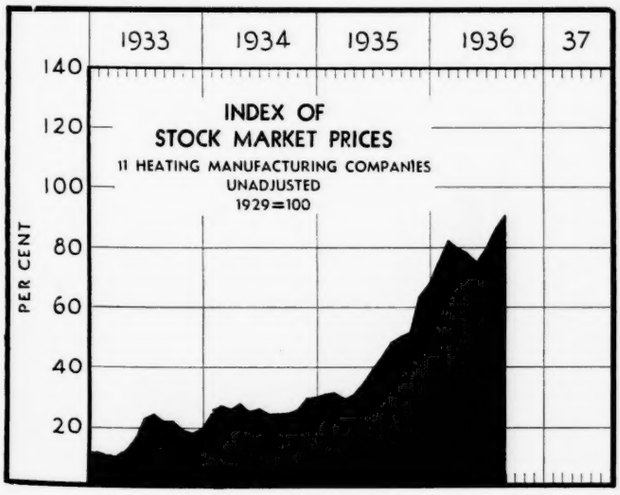
HEATING BUSINESS TRENDS

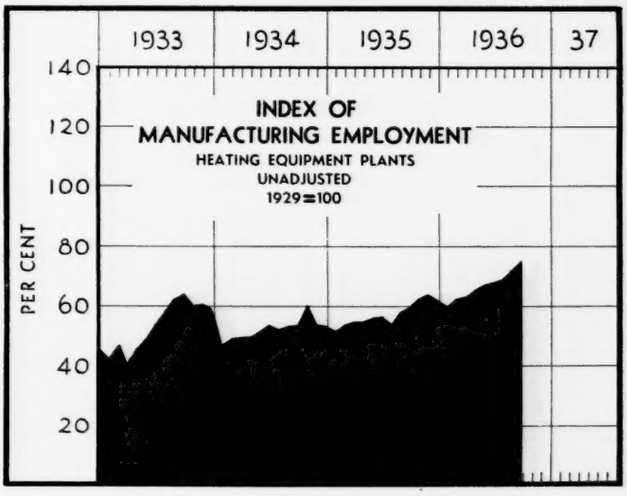












Degree-Days for Checking District Steam Consumption†

By D. H. LITTLE‡

SINCE its introduction ten years ago, the degree-day has been widely used as a means of comparing and checking the fuel consumption of buildings.

In general, the degree-day is used as a measure of the heat demand as this demand is affected by changes in the outdoor dry bulb temperature. The unit does not take into account changes in heating demand due to wind velocity, solar radiation, construction of the building, efficiency of heating plant and fuel, or the influence of rain and snow.

The district heating industry lends itself very suitably to the use of the degree-day inasmuch as two of the discrepancies ordinarily encountered in the use of the unit are eliminated; namely, the efficiency of the generating plant remains constant, and the quality of the steam is always the same upon entering the consumers' premises.

In spite of its limitations, the degree-day is as yet the most suitable means of comparing and checking steam consumption.

The district heating utilization engineer uses the degree-day probably as much as any other person engaged in the heating industry. With as many as thirty buildings on his active list, degree-day comparisons are constantly being made between the previous year's operation and the current season operation of a single building, as well as comparisons of seasonal operations of all the buildings on his list.

It is customary in many companies to keep a weekly running record of the steam consumption in pounds per degree-day per 1,000 cu. ft. of building volume for each important customer. These sheets are kept by months, and as a means of quick comparison, the corresponding months' sheets for two years previous are attached to the current plot.

In addition to the plot showing the variation in consumption with degree-days, there is also plotted a "bogey" line which represents the estimated steam consumption in pounds per degree-day which was used as a basis in selling the job. Fig. 1 shows a typical sheet of this type which is a record of one month's operation for a Boston building. The "bogey" line in this particular case was fairly well adhered to, indicating that a good estimate had been made, as well as efficient operation of the heating system on the part of the building engineer.

These sheets are plotted and examined weekly and any building which shows any abnormally high consumption is immediately visited in an effort to determine the cause. Very frequently, these weekly checks serve to locate faults in the system which might otherwise continue for a much longer period.

In some instances, these records have proved so representative of the building's operation, that changes in the building operating personnel are easily recognized by an abrupt change in consumption. In buildings of 1,000,000 cu. ft. or more where the consumption is large, small faults (for example, a trap blowing line steam to the sewer) or mildly inefficient operation are not recognizable from the ordinary weekly plot since this source of waste constitutes such a small portion of their whole consumption. In such cases where it is felt that this is likely to happen, the scale of the ordinate of the plot is enlarged and this serves to magnify any errors or faults and makes them more readily discernible.

The utilization engineer finds these charts invaluable when a new building engineer is employed as he is then able to show the new operator the results of the operation of his predecessor. In nearly all cases the new man attempts to beat the old record and very frequently does by con-

†Honorable mention, HEATING & VENTILATING's Degree-Day Competition.

‡Utilization Engineer, Steam Heating Service Dept., The Edison Electric Illuminating Co. of Boston.

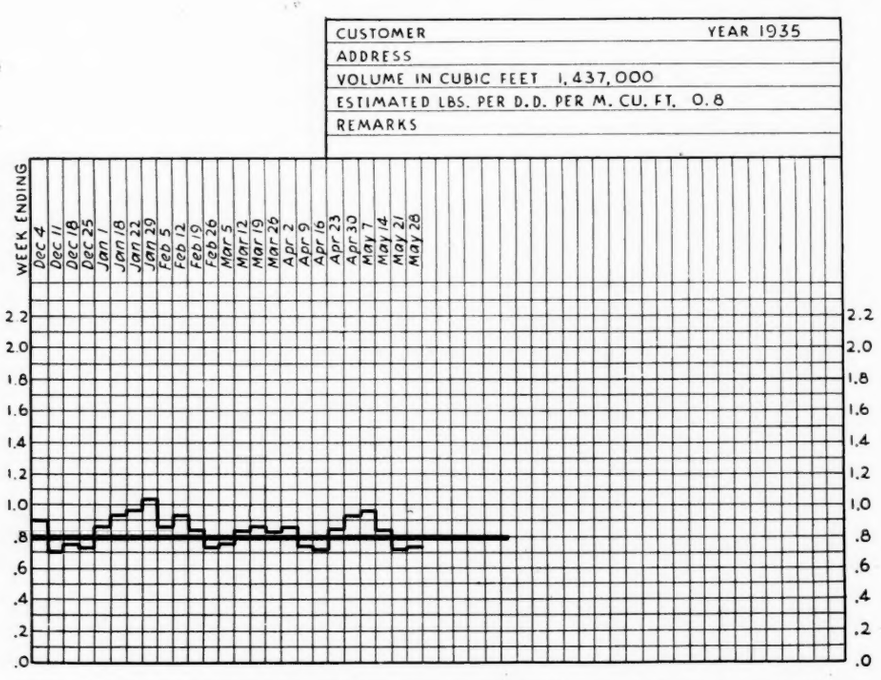


Fig. 1. Form for checking daily steam consumption used showing variations from a predetermined "bogey" line.

stant application in operation of the system. In one particular group of buildings which is owned by the same company but located in different parts of the city, degree-day comparisons for each building are given to all the operators. Needless to say, the man at the tail end of the list watches his system a little more closely in an effort to get off the bottom. Curiously enough the relative consumptions of the buildings are constantly changing, and a good deal of "ragging" to the worst operator of the group takes place each month. The excuses that are offered by the loser are such that it clearly indicates how well the systems are checked and watched. In this particular case, the degree-day has earned considerable money for the owner of these buildings in reduced steam consumption.

In addition to the plot of consumption in pounds per degree-day per 1,000 cu. ft. of building volume which is shown to the operator each month, the building manager is sent a card each week which tells him his previous week's consumption, average temperature, average wind velocity, number of degree-days, and the steam consumption per degree-day.

In those cases where the steam consumption is very closely watched, the consumption in pounds per degree-day per 1,000 cu. ft. of building volume is plotted daily in a slightly different manner, as Fig. 2 illustrates.

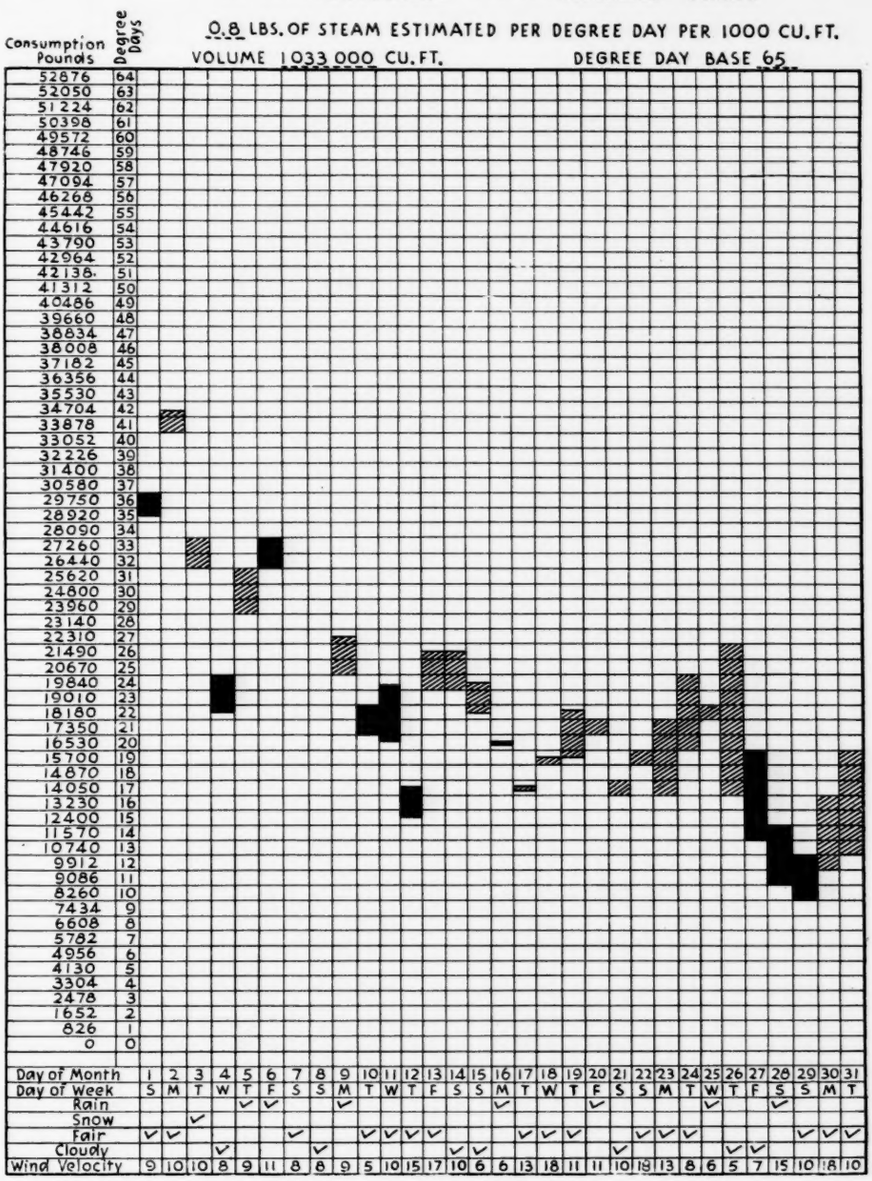


Fig. 2. Another form of chart for recording and checking daily steam consumption.

The estimated or optimum consumption in pounds per degree-day per 1,000 cu. ft. of volume is determined by calculating the heat loss of the building, hours of occupancy, type of building, etc., and set down for each job. The optimum daily consumption, corresponding to a day of any number of degree-days based on the estimated pounds per degree-day per 1,000 cu. ft. of volume, is then calculated and set down in one column. The degree-days corresponding to that consumption are listed in the next. The meters are read daily at midnight, which is the beginning of the degree-day day period, and the consumption is then plotted. If the steam consumption is less than that calculated for the number of degree-days occurring during that day, any savings effected are shown in blue. Excess consumption over that calculated is shown in red.

Fig. 2 illustrates the operation of a Boston building for the month of March, 1936. The "bogey" on this building was set at 0.8 lb. per degree-day per 1,000 cu. ft. For 1 degree-day the consumption here should be 826 lb., for 2 degree-days, 1,652, and so on.

In addition to a record of the daily steam consumption, it is immediately apparent to the operator how well he is doing. The "bogey" is purposely set as low as possible so that it takes constant attention from the operator to keep within the limits set down. These records are kept up to date and made out in triplicate —one for the utilization engineer, one for the building manager or owner, and one for the building engineer. Constant reoccurrence of red blocks on the chart invariably means a conference between these parties to discuss the problem.

In order to eliminate as far as possible the effect of other factors in the operation of the system, a record of climatic conditions is also kept. Each day a check is put in the block corresponding to rain or snow, or fair or cloudy. Average wind velocity and average temperature is also recorded daily.

As yet no definite allowance is made for the effect of rain, snow, sun, or wind on the steam consumption because so far not enough of this information has been analyzed. With continued use of this chart it is hoped that sufficient information on any particular building

will be available to make future corrections.

Not all of the buildings where this type of record is kept have the same degree-day basis. For office buildings, the amount of steam used for heating is proportioned on the average to the difference between 66.2F and the outdoor temperature. For stores, the average base is 64F, for department stores 64.3F, for apartment houses and hotels 68.8F, garages 56.5F, and residences 67F.

In some cases, where by mutual consent the "bogey" is felt to be too low, it is raised, while in other cases the degree-day base is raised. So far, not enough buildings have been studied to give any comments as to which is the better method of aiming at a fair "bogey."

At present the degree-day method of comparing steam consumption is being used as a means of comparing cooling costs in air conditioning, but at this time of writing no standard forms are in use, but all indications point to the continued use of the unit for cooling as well as heating.

Air Conditioned Smokehouse in New Meat Plant

AN air conditioned smokehouse is one of the novel features of the complete system of air conditioning installed this past season in the new packing plant of the Foster Beef Co., Manchester, N. H.

The new smokehouse is provided with a forced draft circulating and heating system, with temperature and humidity control, sawdust being burned to produce the smoke in a smokepot outside the smokehouse and circulated by the air conditioning system instead of the older practice of burning it on the floor of the smokehouse.

A product of an air conditioned smokehouse has a brighter, fresher color, and is in demand by large meat buyers such as chain stores. Another advantage is a reduction in smoking time, resulting in more economic use of the smokehouse. Less shrinkage of the meat also results.

The air conditioned smokehouse is composed of two smokerooms, one for heavy products, and one for light products. They are insulated with 4 in. of sheet cork with ½ in. cement plaster on each side. The products are rolled into the smokehouses on four wheeled trucks instead of utilizing an overhead tramrail system. The doors on the smokehouses are metal clad standard refrigerator doors.

Temperatures maintained in these houses can be adjusted from 100F to 200F. Steam is automatically controlled to the heaters by means of a combination recording and controlling instrument and automatic steam valve and fresh air damper.

The air distributing system consists of a system of ductwork distributing the air and smoke down the center and each long wall of the room at the floor. The smokehouses are arranged for two rows of trucks so that the smoke and air is distributed between the rows and on each side of the rows.

Return duct is located on the ceiling of the smokehouses directly over each row of trucks so that the smoke and air passes through the products positively. This air and smoke then goes back to the fan where it is forced through the heater again and additional smoke is introduced.

Air circulation in the room is based on approximately one air change per minute, although it can vary with the type of product to be processed from a minimum of ½ air change per minute to two air changes per minute. The heating system is designed to take care of conditions when the outside temperature goes as low as 20F below zero.

The relative humidity in the rooms is controlled by admitting more or less fresh air to the unit; that is, as lower relative humidity is required in the rooms, more fresh air is introduced to the fan and because of the low moisture content of the fresh air, it creates a correspondingly lower relative humidity in the smokehouse.

This is another method of controlling smoke density because if 100% fresh air is used, a light smoke will be obtained, and if 100% recirculated air is used, a heavy smoke will be obtained. An exhaust connection with a pressure damper in the ceiling of the smokehouse is provided for the escape of the air when more fresh air is introduced to the system.

The new plant required refrigerating apparatus for the following list of cold storage rooms, with the temperatures as indicated.

	Temperatures
Pickle cellar, 45 ft. 6 in. x 28 ft. 0 in. x 8 ft. 11 in.	38-40F
Storage cooler for beef, 62 ft. 6 in. x 28 ft. 0 in. x 10 ft. 8 in.	34-36F
Fresh pork cooler, 31 ft. x 14 ft. x 10 ft. 8 in.	30-32F
Sausage packing cooler, 31 ft. 0 in. x 14 ft. 0 in. x 10 ft. 8 in.	45-48F
Boning and shipping cooler, 32 ft. 6 in. x 28 ft. 0 in. x 10 ft. 8 in.	45-50F
Sausage chill room, 28 ft. 0 in. x 16 ft. 0 in. x 10 ft. 7 in.	45-50F

In addition to the above rooms, all of which were to be completely air conditioned, there were two rooms in which it was decided to use the conventional type of coils. These rooms were:

Freezer, 28 ft. 0 in. x 24 ft. 6 in. x 10 ft. 7 in.	10-12F
Butter, cheese, egg cooler, 20 ft. 0 in. x 16 ft. 0 in. x 7 ft. 11 in.	34-36F

A relative humidity of 82% to 85% is maintained in the beef storage cooler, the sausage packing cooler and the boning and shipping cooler. A higher relative humidity is carried in the pickle cellar due to the great amount of moisture in this room and the great number of open vats; however, walls and ceiling of pickling room are kept absolutely dry. In the sausage chill room the relative humidity will vary. The purpose of this room is to chill the sausages and other cooked meats as quickly as possible after they leave the water bath which follows smoking and cooking. After the products leave the chill room, they are placed in the sausage packing cooler.

Air Conditioning and Its Effect on Hay Fever and Pollen Asthma†

By WILLIAM H. WELKER‡

THE number of persons in the United States suffering from hay fever has been estimated at from one to four million by different men working in the field. It is generally agreed that there has been a marked increase in the number in the last decade. This is explained on the basis of increased exposure to pollen for which automobile transportation is largely responsible.

A little over half a century ago it was first definitely shown that hay fever was caused by pollen. It required more than 25 years to establish the fact that the pollens of common and giant ragweeds are responsible for a very large percentage of the existing hay fever. Golden rod, which had received the blame of the public, is found actually to be responsible for such a small percentage of hay fever that it can be disregarded as a causative agent. Its pollen is sticky and is consequently not carried by the wind to any appreciable extent. The ragweed pollens are believed to be responsible for approximately 85% of the autumnal hay fever in that portion of the United States east of the Rocky Mountains. In the Pacific and Rocky Mountain states the wormwoods are the leading causative factors. Other plants, grasses, and trees likewise give off pollens which produce somewhat similar effects but their pollinating seasons are very much shorter, and, consequently, the disturbance lasts for only a few days. The ragweed season is much longer. In the Chicago area it begins about the 15th of August and lasts until the first killing frost.

Billions of microscopic grains of pollen from the ragweed, or other plants, are dislodged from the plant and carried by the air currents. Because they are so light they may be carried for great distances through the air. There are observations showing that relatively large quantities of certain pollens have been carried as far as 35 miles, and, in a few rare instances, it has been found that they were definitely carried over 200 miles. Pollen grains have also been found in the air as high as 17,000 ft. above the ground. From these observations it can be seen that the air currents are quite effective in distributing the pollen over relatively large areas. The pollen grains are so small that they cannot be seen with the naked eye. (Size of pollen grains of common ragweed, 15 microns; of giant ragweed, 20 microns; one micron = one thousandth of a millimeter.) They are yellow in color and are responsible for this color as seen on the ragweed plant during the pollinating season.

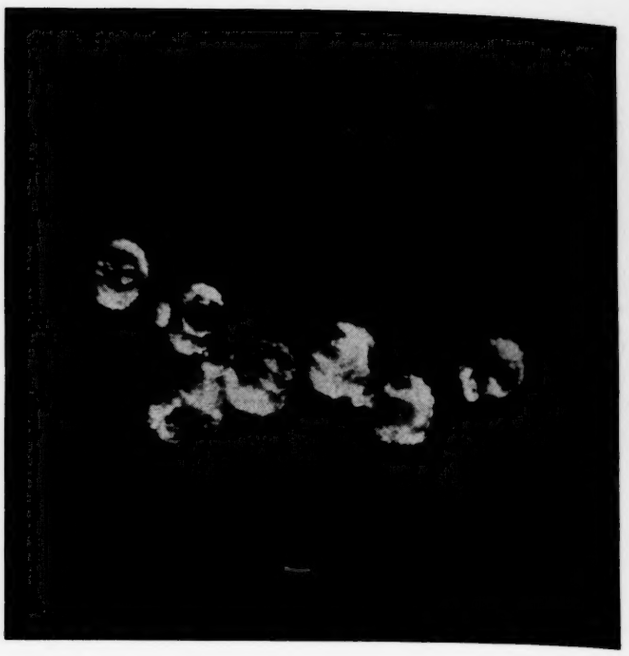
†Paper presented at the First Annual Conference on Air Conditioning, University of Illinois, May, 1936.

‡Professor of Physiological Chemistry and Head of Department, College of Medicine, University of Illinois, Chicago, Ill.

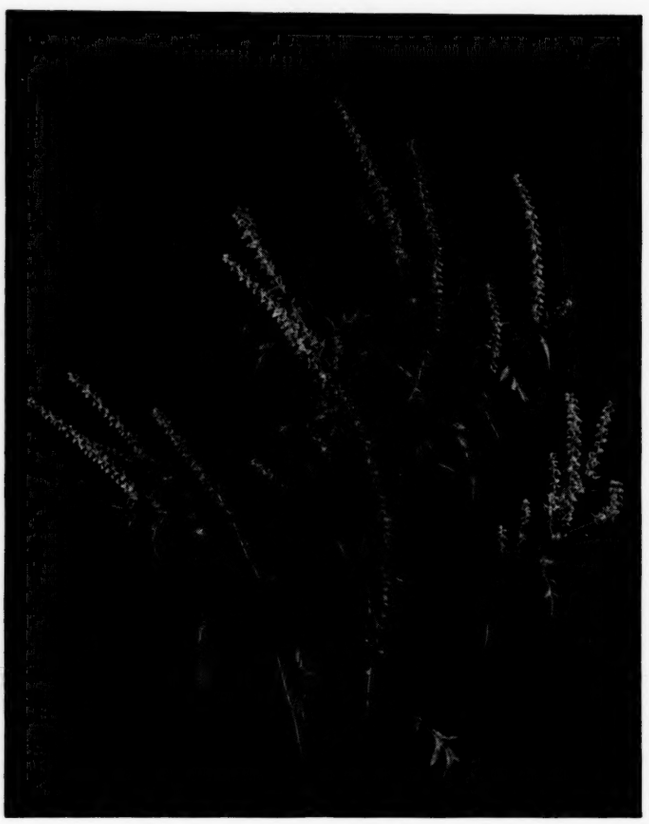
The symptoms of hay fever are running nose, watery and itching eyes, and general symptoms accompanying a typical head cold. Fortunately, these symptoms appear only in those individuals who have become sensitized to the pollen proteins. Years ago by animal experimentation it was conclusively proven that the individual can be sensitized to a given protein by injection of this protein into the bloodstream, provided the protein is antigenic. If a second injection is made after an interval of a week or ten days, the animal shows symptoms that are quite characteristic. The quantity of protein required in the first, or sensitizing, injection is so small that it is almost unbelievable. As a result of these findings it seems obvious that persons reacting to pollen must have had some of the protein of the pollen enter their bloodstream. Apparently in some individuals, and perhaps under conditions where there is congestion of the lining mucous membrane, these proteins may be absorbed from the air passages and the lungs. If subsequently an appreciable amount of pollen lodges in the air passages and the lungs, sufficient protein may be absorbed to produce the symptoms characteristic of hay fever.

The only relief offered by medical treatment consists of a series of injections of pollen protein in increasing amounts two months or so before the hay fever season starts in an attempt to desensitize the individuals to pollen protein. Some allergists recommend injections over the whole year. If this treatment is successful, the individual who formerly showed symptoms of hay fever on exposure to pollen fails to show such symptoms, or shows symptoms of very much lesser degree. Not all individuals who usually suffer from hay fever respond to this treatment, and those that do respond must be treated each season because the so-called desensitization lasts only a relatively short period of time. Occasional exceptions to this rule have been noted.

For four hay fever seasons in collaboration with Dr. B. Z. Rappaport and Dr. Tell Nelson of the Department of Medicine studies have been conducted on the effect of filtration of air on the relief of symptoms in hay fever and pollen asthma. Our experiments were undertaken to see whether, by relatively simple apparatus, we could remove a sufficient portion of the pollen so as to give relief to hay fever sufferers. We used a six-bed room the first season, an eight-bed ward the second season, and an eight- and a four-bed ward in the third season. One hundred and seventeen patients with hay fever of the pollen type, and with skin tests positive to ragweed pollen protein, were studied for an aggregate of 483 nights. The



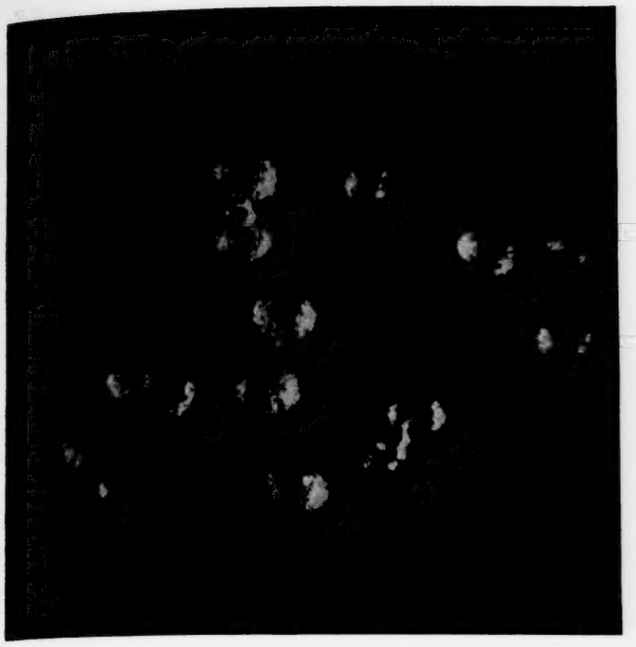
(Above) Short ragweed plant. (Below) Short ragweed plant during pollinating season. (Upper Right) Pollen grains of the short ragweed magnified 600 diameters with dark field illumination.

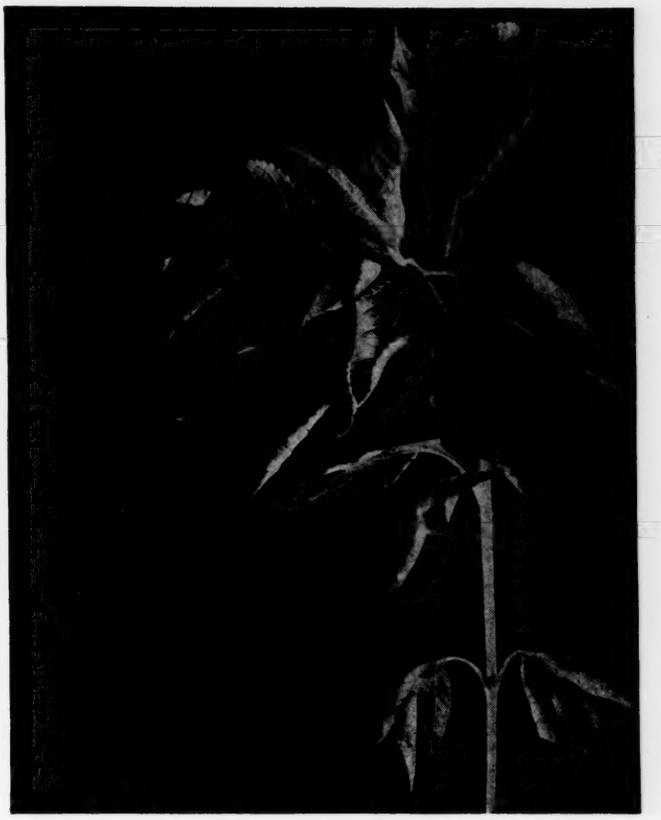


air was propelled from the outside into the ward by means of centrifugal blowers. This arrangement places the ward under a slight positive pressure and consequently no particular precautions had to be taken as to sealing the windows and doors. The filter material that we have found most successful is a cellulose filter (really a paper) of very loose texture, through which the air is drawn. As soon as these filters show any clogging effects from the dust that accumulates on them, they are replaced with fresh filters. These filters are inexpensive.

The amount of pollen in the air was determined by counting the number of pollen grains on definite areas of microscopic slides. These slides were coated with a thin film of vaseline, which held pollen that came in contact with it. The slides were exposed in still air (settling count) and in moving currents of air for 24 hr. During one of the hay fever seasons in our location in Chicago, the maximum was slightly below 700 pollen grains per cubic yard as determined by the settling counts. By comparing the pollen counts outdoors and in the ward we found that we could remove between 98 and 99% of the pollen. This is sufficient removal to make practically all the hay fever sufferers comfortable. To attain such high efficiency it was found necessary to have the air pass through the filters at slow speed; this means that the filter areas have to be relatively large. Mechanical vibration has to be eliminated from the filters, since this produces a sifting effect and has a tendency to permit pollen to go through. This is accomplished by making flexible connections between the blower and the filter forms.

In the air from which practically all the pollen had been removed, most of the hay fever sufferers were relieved completely, or almost completely, of all their symptoms in from ½ to 1½ hr. Freedom from these symptoms continued as long as they remained in the pollen-free air. On their return to pollen-laden air, either outdoors, or even in the hospital corridors, the symptoms rapidly reappeared. Our experiments showed





(Above) Giant ragweed plant. (Below) Giant ragweed plant during pollinating season. (Upper Left) Pollen grains of the giant ragweed magnified 600 diameters with dark field illumination.

that personal efficiency could be increased by providing filtered air in the sleeping quarters of hay fever sufferers. Under these conditions they secured a good night's sleep, which was not usually the case if they were exposed during the night.

Individuals who have suffered from hay fever for a number of seasons may develop asthma for which the pollen is solely responsible. The number of hay fever sufferers in which asthma ultimately develops has been given by various authorities as ranging from 15 to 40%.

Pollen asthma is a more serious disturbance, accompanied by changes in the lungs, and, therefore, requires longer confinement in filtered air before the relief from symptoms is obtained. Forty-seven pollen asthma patients were studied in this work. Our patients required from a day-and-a-half to four, or even five, days continuous confinement before the symptoms disappeared, and in a few of the cases relief from symptoms was not obtained even then. For some of them the relief was profound. They were unable to sleep in pollen-laden air unless they could do so sitting up in a chair. In the pollen-free room they could get normal sleep.

The results in these experiments show definitely that when pollen is excluded from the environment of individuals suffering from hay fever, or pollen asthma, their symptoms disappear, and they remain free from symptoms as long as they are not again exposed to pollen-laden atmosphere.

We feel that our findings can be utilized in the treatment of hay fever and pollen asthma in the home, and elsewhere, in the form of an apparatus which will deliver into the room sufficient air for the occupant and at the same time carry it through filter material that will effectively remove the pollen. It would be applicable as well to hotels, factories, schools, stores, and places for public assemblies. In fact, there are at the present time certain stores and public buildings equipped with filters of the same type as we have been using in our experiments that have been discovered by the public to give marked relief to hay fever sufferers.

These buildings have become literally hay fever resorts. The removal of pollen in these buildings is not, of course, as complete as we have obtained in our experiments here in the Illinois Research and Educational Hospitals because of the less perfect design of the filters. There are two private homes in the state of Illinois that are completely equipped for filtration of the air for the removal of pollen which have given very definite relief to the hay fever sufferers in these homes. The question of the efficiency of the pollen removal necessary to give relief is dependent very largely upon the degree of sensitivity of the hay fever patient. If the sensitivity is great, high efficiency is essential; if the sensitivity is of a low grade type, less efficient filters will give relief.

We have studied the effect of air cooling without removal of any of the water from the air. This results in a higher degree of saturation of the air with water. In our experiments with a 10F cooling below the temperature in the rest of the hospital, we had an average increase of 10% in the relative humidity. Our hay fever and pollen asthmatics were definitely less comfortable in this cooler room, with the increased percentage saturation of water, than they were in rooms with higher temperature but lower percentage of water saturation.

Effect of Low Humidity

We also studied the effect of the air with low relative humidity on a series of pollen asthmatics. This ward with eight beds was run at around 30% relative humidity and a temperature of 79-80F. This condition seems to be slightly more favorable for pollen asthmatics than a room that had a higher relative humidity. This study was conducted because it was observed in the ward where the humidity was not controlled that after a heavy thunderstorm all of the patients had asthmatic seizures. In this practically pollen-free air the disturbance could not be attributed to pollen. In the following hay fever season an experiment was conducted to see whether these seizures would occur where the relative humidity was maintained at a constant point. It was found that they do occur, but the onset is delayed, the attacks are possibly not as severe, and recovery seems to be somewhat more rapid. However, it is quite clear from the results of these experiments that the prime reason for the asthmatic seizures is not the marked increase in the relative humidity, which occurs as a rule during heavy thundershowers. Since ozone is an accompaniment of heavy electrical storms, we introduced ozone into the air of the ward in quantities larger than occur during electrical storms without producing any effects whatever. We have also made preliminary experiments on the effect of negative ionization of the air with no effect whatever on the patients in the ward. We feel that these experiments should be repeated using very much higher concentrations of negative ions. The reason for the onset of asthmatic seizures in a pollen-free atmosphere under these conditions remains undetermined.

From our results it is apparent that the important factor in air conditioning, so far as relief of symptoms in hay fever and pollen asthma is concerned, is the filtration of the air in such fashion that the major portion of the pollen is removed. Additional comfort can be secured by cooling with dehydration.

If air filtration for the removal of pollen is to be used for the relief of symptoms in hay fever, or pollen asthma, it is desirable that a member of the medical profession be called to diagnose the case. Such air conditioning is ineffectual in other conditions. It is desirable, therefore, to be certain that pollen is the causative factor in cases where air filtration is to be utilized as the relief measure.

A number of manufacturers are marketing pieces of apparatus that can be connected to the window of a room by which the air is drawn in from the window and filtered through filter material. Any such machine that does a satisfactory job of removing practically all the pollen and supplying a sufficient volume of air will be capable of giving relief to hay fever and pollen asthma sufferers. Houses equipped with warm-air heating plants, and particularly those with forced circulation, can be equipped with filters for the removal of pollen with a minimum of expense.

Important Features

In purchasing an air filtration machine, there are certain points that can be determined by direct observation. First, the area of the filter material ought to be relatively large. This will insure the flow of air through the filter material at a low speed, which is essential if a high degree of efficiency is to be maintained. Second, there should be no appreciable vibration in the apparatus; should this occur, there is a danger of shaking the pollen through the filters. Third, the volume of air delivered by the machine for a given unit of time must be sufficient to keep the individual comfortable. The Laboratory of the Council on Physical Therapy of the American Medical Association in Chicago has studied the efficiency of most of the air filtration machines for the relief of hay fever, and the public can secure information on this point by contacting that organization.

Our work suggests the possibility that efficient air filtration with recirculation and filtration may be applicable to allergic manifestations connected with other antigenic dusts. The dust from feathers, from animal hair, and cotton produces definite sensitivity in some individuals and results in symptoms ranging from eczema to asthma. House dust is also known to produce definite allergic disturbances that are not referable to any of the known proteins. Recently, one case of sensitivity to building material has been observed. It would seem entirely reasonable to suppose that, with efficient filtration of the air, the concentrations of these environmental dusts could be reduced so that there would be little danger of producing sensitivities in individuals not previously sensitized, and so that they would probably produce no allergic manifestations in those already sensitized.

Grateful acknowledgment for assistance in our work is made to the American Air Filter Co., Louisville, Ky., the Peoples' Gas Light and Coke Co., Chicago, and the General Electric Company.

DUCTS

- MATERIALS
- FABRICATION
- ERECTION

DUCTS

• MATERIALS
• FABRICATION
• ERECTION

WHERE ducts are necessary to provide a passageway for air, or mixture of air and solid or vaporous substances, both the materials selected and the methods of fabrication and erection must meet the requirements of the installation.

Requirements vary a good deal, among them being the necessity of providing a suitable degree of fireproofing, permanence, strength and stiffness, and ability to withstand any actions of the materials being carried which tend to destroy the duct system. The duct system must also be so arranged that operating economy, both in maintenance and in cost of power, may be secured.

Materials

Of the materials available which might be used for ducts a long experience shows that sheet metals are suitable. The pressures inside ducts are so slight that strength is usually only a minor consideration but a suitable degree of stiffness at least sufficient to resist noise propagation is desirable. Sheet metals meet these requirements admirably.

Variations in the substances being passed through the ducts often make it necessary to exercise considerable care in picking out the proper sheet material from those available. Among the sheet materials which can and are frequently used for ducts are copper and copper alloys, including copper-bearing steel, iron and carbon steel. Sometimes requirements can be suitably met by coating the sheet. Galvanized iron and steel sheets are most widely used of all those available.

Weights, Dimensions, and Gages

All the sheet metals come on the market in a number of standard thicknesses, widths, and lengths. The gages most frequently used vary between what are known as No. 8 and No. 26 gage with the U. S. Standard sheet metal gage commonly used as a means of designation. Table 1 gives the weights and thicknesses of iron and steel and copper sheets. Weights and thicknesses of other sheet metals are substantially the same as those included in the table. In cases where the use of other metal sheets is contemplated accurate thicknesses and unit weights can ordinarily be found from tables furnished by the manufacturer.

When the unit weight in pounds per square foot is known, it is fairly easy to compute the total weight of sheet metal in a given piece of ductwork when the dimensions of the duct have been fixed. However, such calculations can be avoided by the use of tables prepared to show the total weight of the duct of a given gage per linear foot. A convenient set of tables for this purpose is contained in HEATING & VENTILATING's Reference Data Nos. 1-8, inclusive, which give weights of rectangular steel ducts per linear foot for ducts of 1 in. x 1 in. up to 60 in. x 60 in. An alternative method of finding weights of galvanized steel ducts is by the use of a nomographic chart. Such a chart has been printed as HEATING & VENTILATING's Reference Data Nos. 9-10.

There are no set, uniform, and generally accepted rules or standards for specifying the gage of metal which shall be used with any particular duct. However, there is a certain uniformity in practice. The principal point to be kept in mind in connection with deciding the gage of metal which should be used with any duct is that the completed network must be sufficiently strong and stiff and at the same time reasonably economical to construct. Even where tables giving the gages commonly used are followed, it is not at all extraordinary for usual practice to be departed from in particular cases. In other words, tables giving gages commonly used with ducts of a given size are for use as a guide and are not to be followed slavishly. Table 2 has been prepared to represent what may be considered common practice in determining the gage to be used. This table appears on page 49.

Forming and Fabricating

The problem of forming and fabricating ducts from flat sheets is one of bending, shaping, cutting,

TABLE 1.—WEIGHTS, GAGES, AND THICKNESSES OF IRON, STEEL, AND COPPER SHEETS

Iron or Steel Sheets			
Gage, No.	Thickness, In.*	Weight, Lb. Per Sq. Ft.	
		Black	Galvanized
8	0.1685	6.88	7.031
10	0.1379	5.63	5.781
12	0.1072	4.38	4.531
14	0.0766	3.13	3.281
16	0.0613	2.5	2.656
18	0.0490	2.00	2.156
20	0.0368	1.5	1.656
22	0.0306	1.25	1.406
24	0.0245	1.000	1.156
26	0.0184	0.75	0.906

Copper Sheets, Rolled to Weight		
Thickness, In.	Weight Per Sq. Ft.	
	Oz.	Lb.
0.0648	48	3
0.0486	36	2¼
0.0378	28	1¾
0.0324	24	1½
0.0216	16	1

Standard widths are 24 in., 26 in., 28 in., 30 in., 36 in.
Standard lengths are 72 in., 84 in., 96 in., 120 in.
*Thickness of galvanized sheets approximately 0.004 in. greater.

and joining sheets together in such a fashion that not only will the fabricated duct be workmanlike but that the work of fabrication will have been accomplished economically.

A complete network of ducts usually requires a certain amount of work being done in a shop or factory supplemented by work necessary to erect the ducts and secure them in their proper position in the building structure. The common practice is to do as much of the fabrication in a shop or factory as possible since better working facilities can be provided. Where ducts must be formed in a temporary shop in the building where they are to be erected, it commonly costs more per pound to get the ducts formed than if the work can be done on equipment permanently located in a shop or factory.

Work in the shop or factory, however, is commonly limited by the necessity of transporting the finished product to the site. Often this means that the duct is formed and fabricated in short sections in the shop and then these short sections joined in the field.

As a result, the usual shopwork on ducts consists of cutting, shaping, and forming the sheet to meet the dimensions specified, joining sheets together where necessary. To do this satisfactorily it is necessary to join the ends of the sheet by a seam or fastening which runs lengthwise of the duct. Such fastenings are commonly known as longitudinal seams or longitudinal joints. In order to facilitate fastening together in the field the ends of the duct are provided in the shop with some method of fastening which will make the field erection relatively simple. At the same time it is frequently convenient to do a certain amount of bracing or stiffening in the shop so that the finished duct will have the necessary strength and stiffness.

On the following pages are described and illustrated some of the principal methods in common use of making longitudinal joints and cross joints, methods of stiffening and bracing the ducts, means used for supporting the ducts together with some reference to commonly used shapes of some of the fittings and accessories frequently encountered. Completeness is not aimed at in this discussion. Only some of the points frequently encountered in connection with the design and layout of ducts are included.

Internal Bracing

Where the width of a duct is great some form of internal bracing is desirable to provide sufficient stiffness for the top and bottom panels. Convenient means of accomplishing such bracing are shown in Figs. 1 to 4. With all these methods the brace can be made of sheet metal and if set parallel with the axis of the duct the bracing offers little resistance to flow. (1) or (4) can be made of structural shapes.

Fig. 5 illustrates the diamond brake—a means of securing additional stiffness and especially desirable for preventing vibration of the metal panels where the duct is of large size. It is also sometimes used to improve the exterior appearance of the finished ducts. Common practice is to use the diamond brake in the side panels only. When this is done no outside bracing or supports are passed over the decorated portion of the duct.

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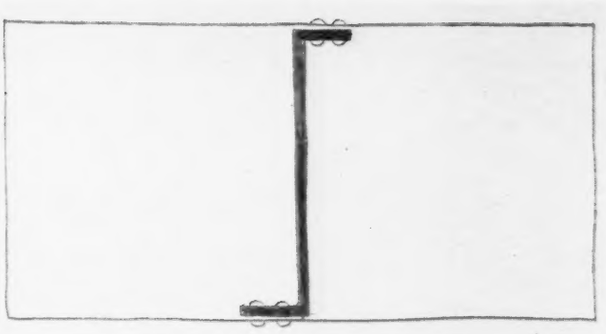

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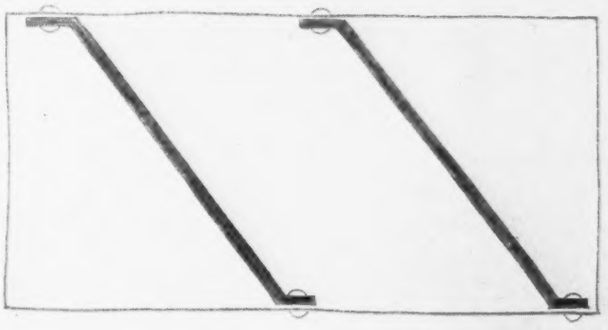

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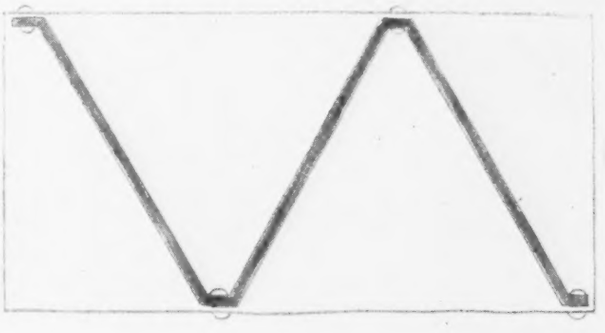

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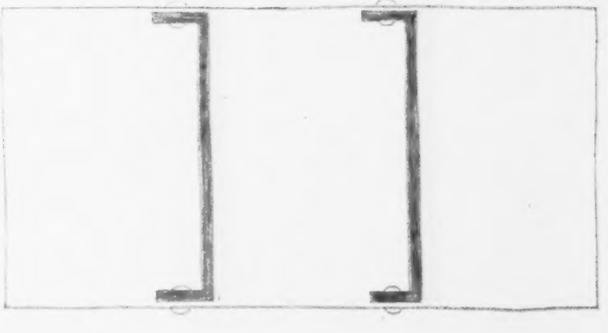

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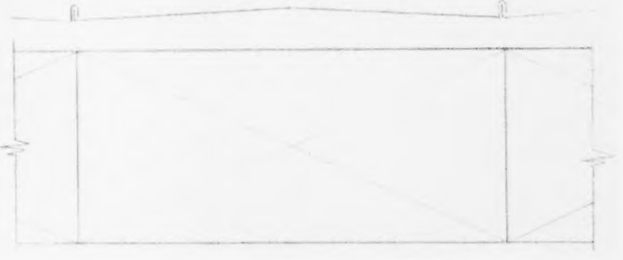
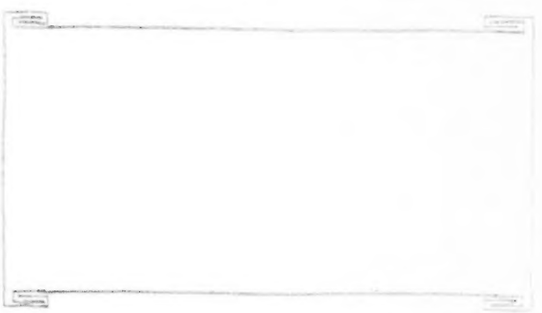


LONGITUDINAL SEAMS

6



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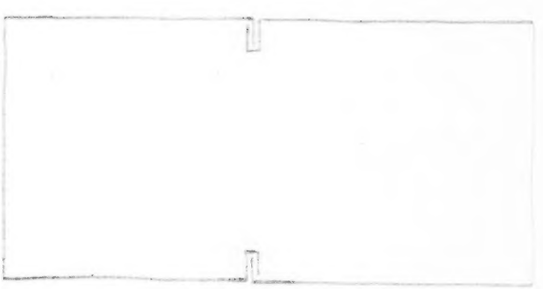

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9

10

MAKING the longitudinal seams in sheet metal ducts is an important operation. The seam joins together the ends of the sheet to complete the duct. It is essential that the seam be tight—tight enough to prevent the escape of substances being carried in the duct. Tightness is the prime requisite but when seams are formed in some ways the shape of the seam can also be a means of adding stiffness.

The method used in making the seam has to accommodate itself to the labor and equipment available. In general there are two methods of making the longitudinal seam. One is by the use of welding; the other is by bending and forming the ends of the sheet and fastening the ends together in some suitable way. There are a great variety of means of bending and forming the sheet, a few of which are illustrated on this page.

Welding as a means of securing a longitudinal joint has been used to some extent for a long time. With the improvements in welding and brazing methods, the use of welding has received increasing attention in recent years. A number of manufacturers apply factory methods, use welding, and turn out standardized ducts of various sizes and lengths. These are frequently known as "prefabricated" ducts. Generally, the extensive use of welding is not considered suitable in field erection. On the other hand, joints formed by bending and shaping ends of the sheet metal can be accomplished with rather simple equipment and a great many widely distributed shops are equipped to do so. Some of these make up ducts only on order and to meet specified dimensions. Such ducts are frequently known as "fabricated" or "tailor-made" ducts. Others make up ducts in stock sizes within limits. Such shops approach the use of factory methods and in some cases use welding extensively.

Where welding or brazing is used it does not introduce any great or especially distinctive problem so far as the formation of the weld itself is concerned. On these pages, therefore, special attention is given to longitudinal seams formed by bending and shaping the ends of the sheet.

A corner double seam is shown in (6). This joint is not used frequently as it is cumbersome and difficult to nest.

The slip lock shown in (7) can be used where power-driven machines are available for bending the edges. Use of this joint eliminates the necessity of riveting or buttoning.

For ducts of 20 to 16 gage metal the standing seam shown in (8) can be used. The seam is placed on the inside of the duct and gives some stiffening

LONGITUDINAL SEAMS

to it. This seam, closed and riveted at approximately 12-in. intervals, is from ¾ in. to 1 in. high.

Another type of longitudinal standing seam is shown in (9). The vertical side sheet is given two 90° brakes over the standing edge of the top sheet, peened tight and riveted through the seam.

A seam frequently used on large ducts which are fabricated in the field is shown in (10). In erecting, the top and one side, then the bottom and the other side, are put together. In building these ducts the hangers are first erected and the ducts built inside the hangers.

A detail similar to that in (6) is shown in (11), the seam being the same in each but only two joints are used in the duct shown in (11). This is the commonest type of joint encountered and provides for snug nesting of the ducts for shipment and gives a smooth exterior surface. The prepared edges of the adjacent sheets are socketed together and the joints peened down, the joint not being effective when in compression. The lap is usually offset to present a smooth surface to the inside of a duct.

The well-known Pittsburgh lock is shown in (12). It is used frequently in making irregular fittings such as elbows and branches and for parts to be assembled in the field. It is used with metals up to 20 gage. The side sheet has an edge prepared in the shop brake with the U-pocket closed due to the pressure of the brake. The U-pocket is then opened by hand and the top sheet bent edge inserted, after which the flange is bent over to finish the joint.

In (13) are shown two forms of lap seams. The side sheet is flanged with a 90° brake and the top sheet riveted to the flange. This joint may be welded instead of riveted.

In (14) is shown a simple seam designed to give bracing at the corners when light gage metals are used.

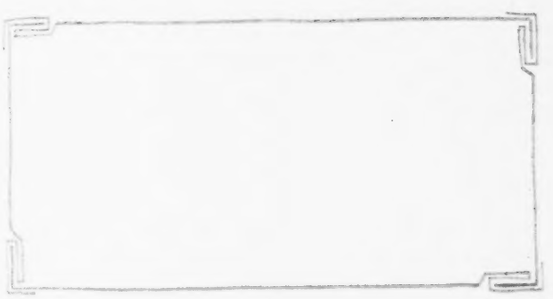
A joint similar to that in (14) is shown in (15), except that the joint is placed on the sides instead of at the corners.

Where riveting is used in making ducts the following sizes and spacings will insure good results:

Gage	Size of Rivets, Lb.
26	1½
24	2
20	2½
18	3
16	6
12	12
Gage	**Center to Center of Rivets, In.**
26	2½
22	3
18	3½
12	4

11

12



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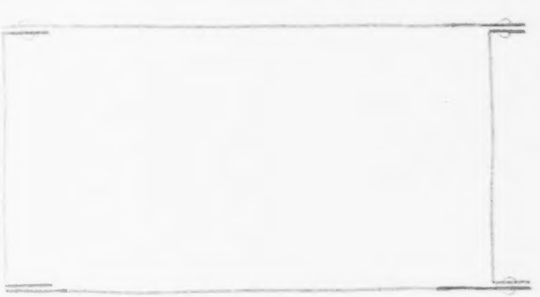

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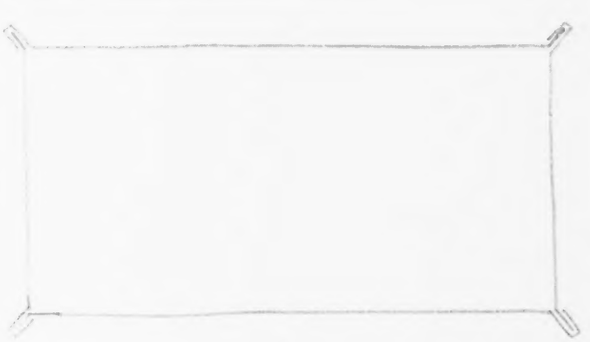

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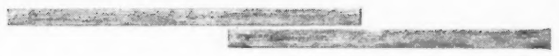
TRANSVERSE JOINTS



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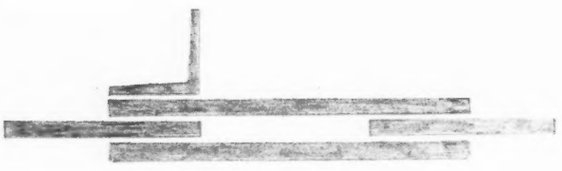

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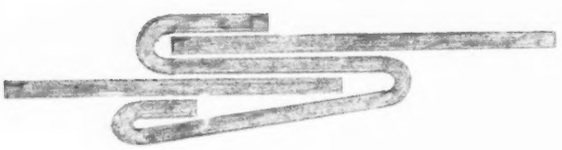

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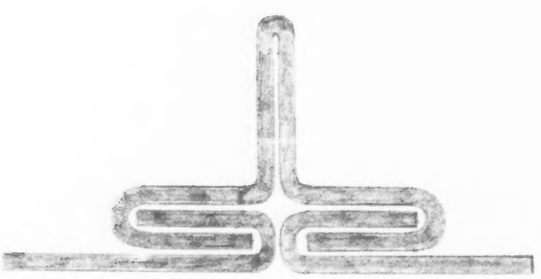

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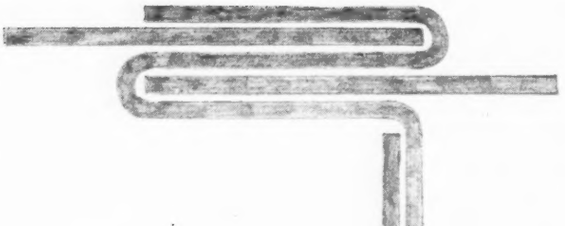

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IN devising suitable transverse joints or seams to hold sections of sheet metal ducts together it is necessary to keep in mind that the joint is not practical unless it will actually hold the joint sections together when erected and also that field erection must be accomplished without the necessity of working from the inside of the duct. Furthermore, the joint must be of such a nature that if the metal sections are formed in the shop, they can be transported to the field without being bent or twisted out of shape since ordinarily there are no facilities in the field for correcting any fault in the shop fabrication.

It is entirely possible to use welding or brazing as a field method for joining together the sections of a sheet metal duct. Where this can be done to advantage, it is well worth consideration. However, by far the commonest method of joining sheet metal duct sections together is by using joints which are formed by bending or shaping the sheet metal itself. Such joints may or may not be supplemented by the use of riveting or spot welding.

In general, there are two types of transverse joints—those whose sole purpose is to join two sections of duct together, and those which have a dual purpose, joining the sections of the duct together and in addition bracing or stiffening the duct. The joints shown on this and the following page are of both types.

A riveted cross seam is shown in (16). This is used only in heavier metals from 14 to 10 gage.

A drive slip joint is shown in (17). The clip is driven over the formed edges of the sheet to be joined and the whole joint peened flat. In assembling this type of joint the top is finished, then the bottom, and finally the sides. The clip is about 2 in. in width.

A transverse standing seam is shown in (18), this joint having a stiffening effect on the duct. In this construction, the end of each section is given a 90° brake, the leg of one being longer than the other by an amount

TRANSVERSE JOINTS

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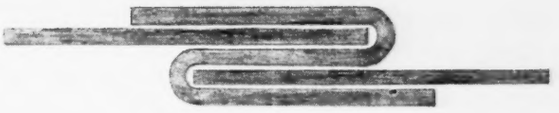

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equal to the height of the seam. The long leg is then bent around the flange to form a 180° socket and the joint peened and riveted.

In (19) is illustrated an expansion slip joint for heavy gage ducts. The lapping strips, made of the same gage as the duct, are riveted to one end of the duct, together with the angle iron. The open ends of the lapping strips allow for admitting the adjacent duct section, which should fit in neatly so that no riveting is needed. The absence of rivets or joining at the open ends allow the duct to expand and contract as the duct is heated or cooled.

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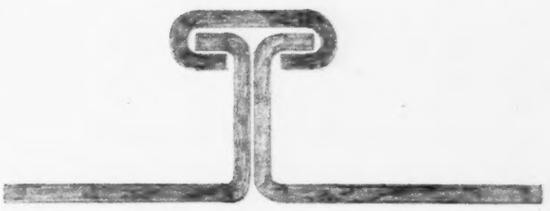

A convenient joint for use in constructing vertical ducts is shown at (20). The "S" is hung on the edge of the lower section, and into its other end is inserted the adjacent upper section. Rivets or screws must be used to prevent the duct from pulling apart if this joint should be used for horizontal ducts.

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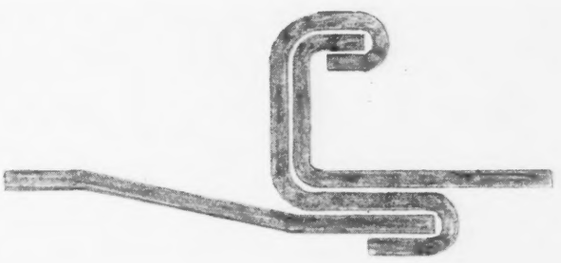

A standing transverse seam is shown in (21), this joint also being one that adds stiffening to the duct. It is of the slip joint type and should be riveted at intervals through the vertical section shown at the top.

Another type of transverse steel lock joint is shown at (22). This is also a stiffening type joint and differs only from (23) in that (22) has the stiffening feature.

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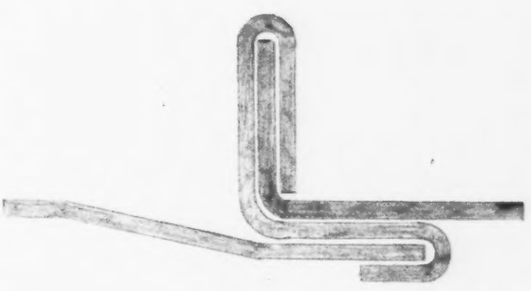

With the slip joint shown at (24) the strips are fastened by screws from the inside whenever possible. No metal lighter than 24 gage should be used for the strip.

An angle type of drive slip joint with stiffening characteristics is shown in (25).

The so-called government joint is shown in (26). With this joint an extra edge is allowed for stiffness.

The standing slip seam in (27) gives a good stiffening rib. This joint is especially desirable on vertical ducts. The S joint is riveted tightly to the lower section.

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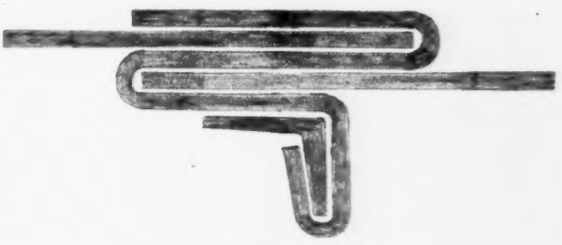


Another bar slip type of transverse seam is illustrated in (28). The angle iron and the five thicknesses of sheet metal are all peened together and fastened with bolts or screws.

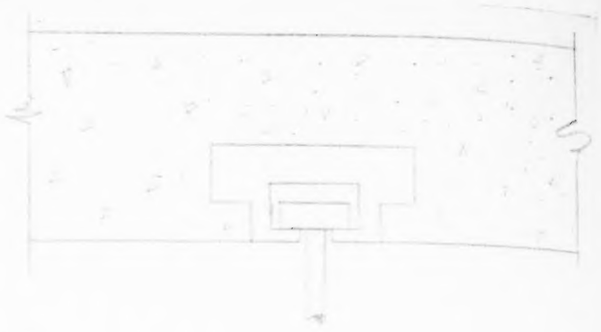
DUCT SUPPORTS

THE method used for supporting horizontal ducts depends on (a) the material from which the duct is being suspended, (b) the degree of permanency of the installation, and (c) the size and weight of duct. It is manifestly impossible to show all the possible variations of duct suspension but a few of the more common methods are illustrated.

The distance between supports for horizontal ducts is from 6 to 8 ft., unless this distance is set by the center to center distance of the beams or joists from which the duct is being hung. If the duct has insulation which adds appreciably to its weight the supports and brace must be installed at lesser distances. Not shown here are wire supports which can be used for small, light ducts. Generally speaking, the very large ducts are supported by iron rods or heavy bands and the medium-size ducts by light angle irons. Hangers or supports for large ducts may have turn buckles for adjusting the height not only to keep the duct level but also to distribute the load properly.

The drawings at (29), (30), (31), and (32) illustrate various methods of suspension from concrete. In (29) is shown an insert which is built into the floor or ceiling when the concrete is poured; rods or hooks are suspended from the insert. The insert is of metal.

The inverted J-shaped hanger shown in



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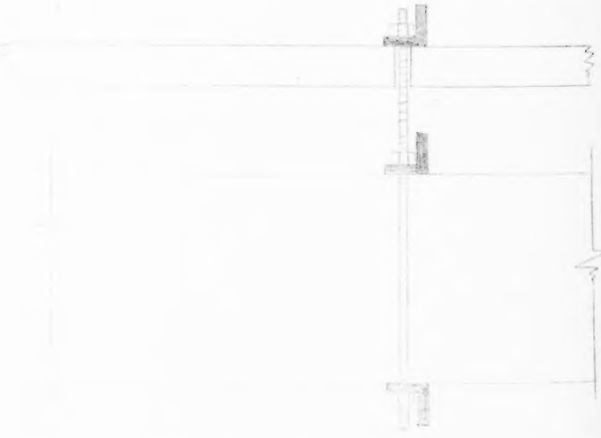

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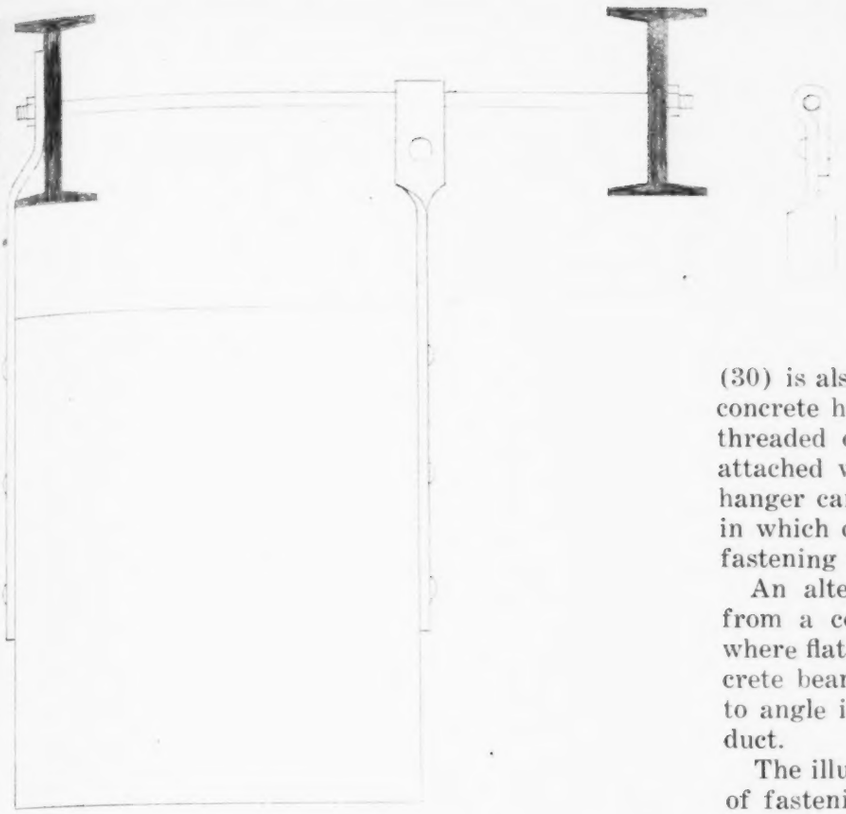

(30) is also cast into the concrete, where the concrete has reinforcing. The rod is usually threaded or tapped for hangers which are attached when the ducts are erected. This hanger can also be made of a flat iron band in which case the exposed end is drilled for fastening the hanger band.

An alternate method of hanging a duct from a concrete ceiling is shown in (31) where flat iron bands are attached to the concrete beam and at the other end are bolted to angle irons which support the top of the duct.

The illustration at (32) shows one method of fastening a strap to concrete and can be used in the application shown at (31). A wooden insert is cast into the concrete; when the duct is erected a screw fastens the duct hanger to the wood.

Where it is practicable to cut through the supporting floor or ceiling, the method shown in (33) can be used. Angle irons brace and support the duct.

In (34) is shown a method for supporting ducts where the ducts are running parallel to an I-beam above. Obviously, if the duct width is approximately equal to the spacing of the I-beams, both sides can be supported as shown at the left in (34). Otherwise, either one or both sides can be supported from a rod passing through the web of the I-beam, as is shown at the right of (34).

Alternate methods of supporting a duct from I-beams are shown in (35), the one at the left being a clamp affair of flat bands attached to the side of the duct, while the

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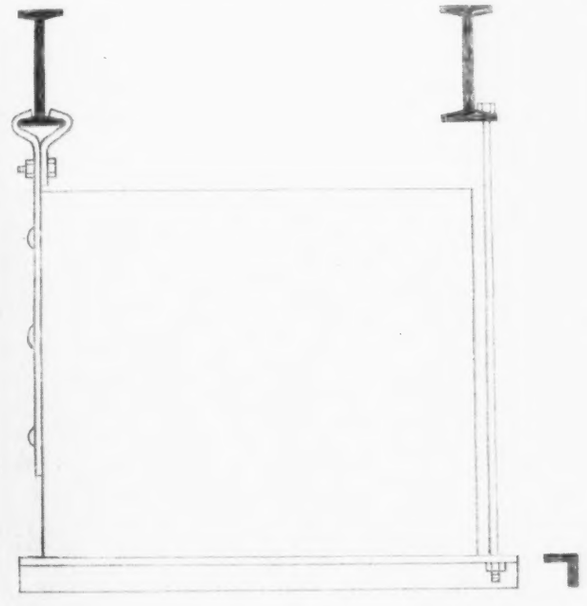

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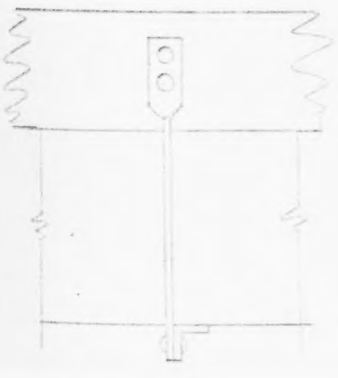

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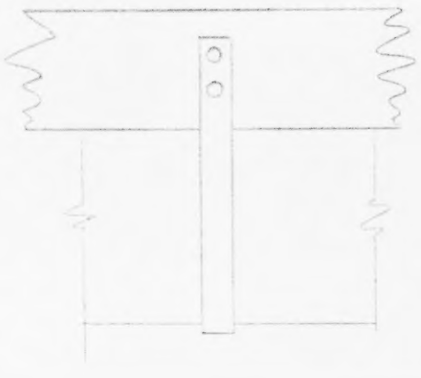

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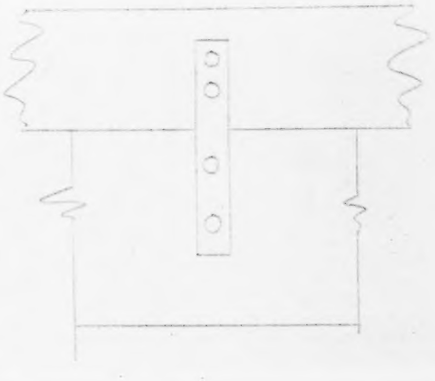

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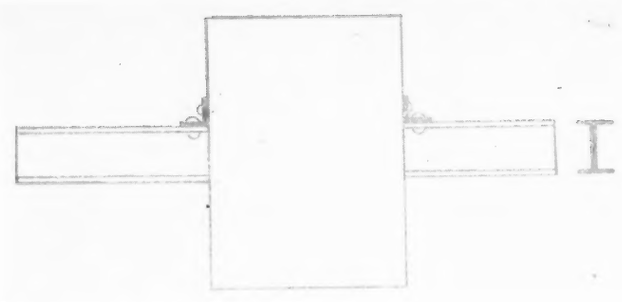

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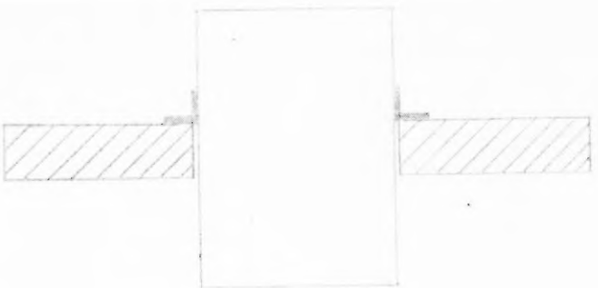

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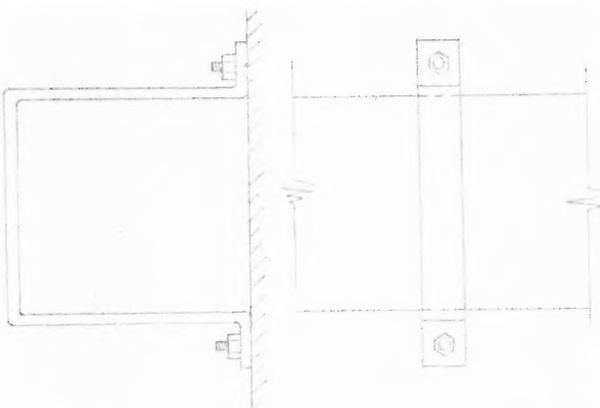

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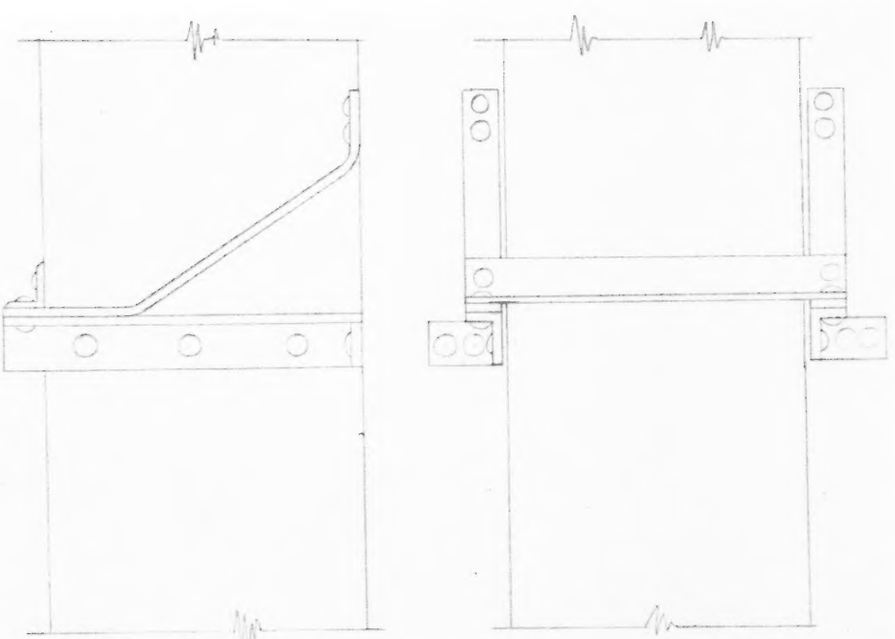

one at the right is a threaded rod supporting an angle iron on which the duct rests.

Perhaps the commonest methods in supporting ducts are those shown in (36), (37), and (38). In the first the flat band, twisted, supports an angle iron on which the duct rests, while in (37) the band passes under the duct and up on the other side to the adjacent joist. In (38) a band is bolted to both sides of the duct.

A method of supporting a duct passing vertically alongside a horizontal I-beam is shown in (39). The I-beam is not cut, as the drawing would lead one to believe, but passes back of the duct. Across the top of the beam and bolted to it pass angle irons which support the duct in cantilever fashion. This method makes it possible to support the ducts every 12 or 14 ft., depending on the height of the floors.

Where a vertical duct passes through the floor it can be supported by bolting angle irons to the duct and letting the extensions of these angles rest on the adjacent part of the floor as shown in (40). The distance between such supports depends, as in (39), on the floor to ceiling distance.

The detail in (41) shows a method which can be used either for a horizontal or vertical duct, but is used more frequently with the latter. When looking at the illustration in connection with a vertical duct consider the view to the left as a plan view and the drawing to the right as an elevation, turned 90°.

The method of support shown in (42) is for metal stacks which require very strong supports. Where such stacks are extremely heavy most of the weight is carried on a foundation at the bottom and the bolts used for fastening the bands to the adjacent wall are run through the wall material, expansion joints not being employed.

EXTERNAL BRACING

AN angle iron running transverse to the duct can be used for external bracing. These can be placed at the top, the bottom, and along the sides, or merely on the top and bottom. See (43). Where such bracing is required the angle can be used at the transverse joint and the adjacent section of duct will also have bolted to it a similar angle iron facing the one on the other section. The two sections are then held together by bolts passing through the vertical edge of the angles.

External bracing can also be given by use of T-irons bolted to the duct, as in (44). These can also be used on the transverse joint in which case the T overlaps both the adjacent sections. This is also true of channel irons where they are intended for bracing transverse joints, illustrated in (45).

Angle iron stiffeners are usually 1½ x 1½ x ⅛ in. weighing 1.23 lb. per ft. or 1 x 1 x ⅛ in. weighing 0.80 lb. per ft. Band iron hangers and stiffeners are usually 1 x 3/16 in. weighing 0.638 lb. per ft. or 1⅛ x ⅛ in. weighing 0.425 lb. per ft. Band iron stock lengths are 18 ft. and 20 ft. Angle iron stock lengths are 20 ft. and 25 ft.

Table 2, referred to on page 40, gives the gages of sheet metal commonly employed for round and rectangular ducts.

TABLE 2.—GAGES OF SHEET METAL COMMONLY SPECIFIED FOR DUCTWORK

Gage, No.	Round Ducts, Diameter in Inches
24	6 to 29
22	30 to 39
20	40 to 49
18	50 and above
	Rectangular Ducts, with Standing Seam Panel Construction, Greatest Dimension in Inches.
24	Up to 34
22	35 to 48 (1 in. stdg. seam)
22	49 to 60 (1½ in. stdg. seam)
20	61 to 90 (1½ in. stdg. seam)
18	Over 90
	Planing Mill and Other Exhaust Systems, Diameter in Inches.
24	Up to 8
22	9 to 14
20	15 to 20
18	21 to 30
16	31 to 39
	Pittsburgh Lock or Grooved Seam, Diameter in Inches.
24	Up to 24
22	25 to 35
20	Over 36*

*Stiffened with angle irons on 4 ft. centers. On 36 in. to 80 in. wide use 1 in. x 1 in. x ⅛ in. angles; on 81 in. to 120 in. wide use 1¼ in. x 1¼ in. x ⅛ in. angles; on ducts over 121 in. wide use 1½ in. x 1½ in. x 3/16 in. angles.

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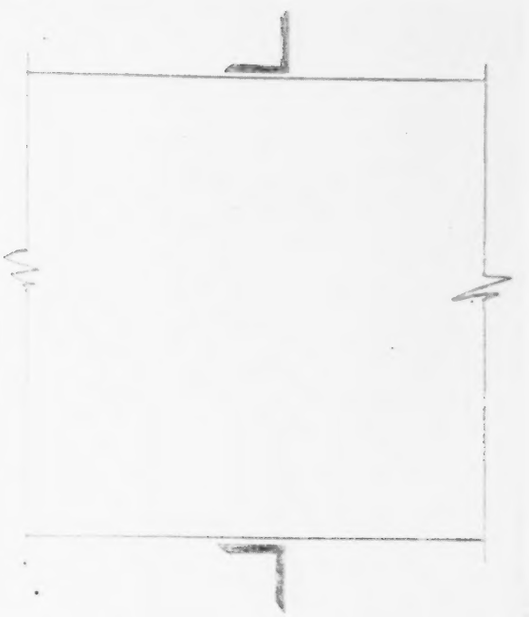

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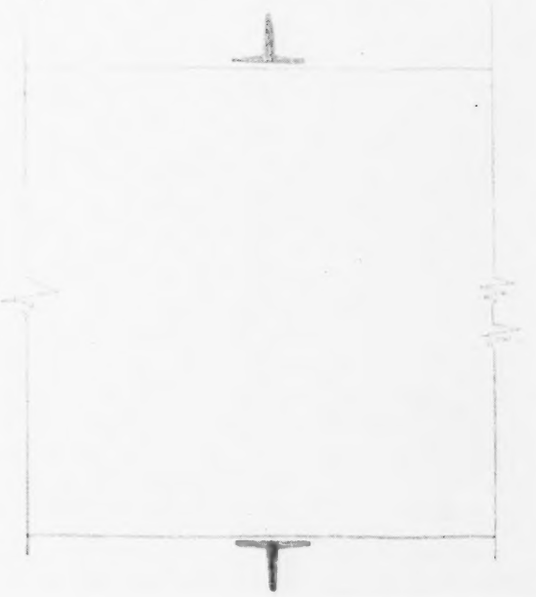

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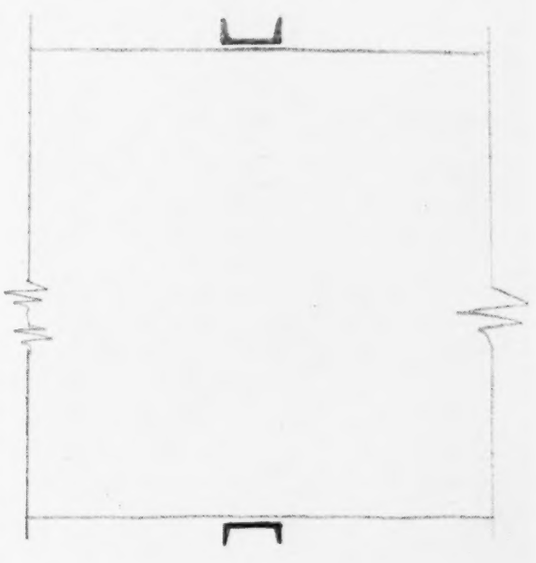

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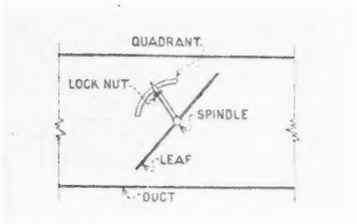

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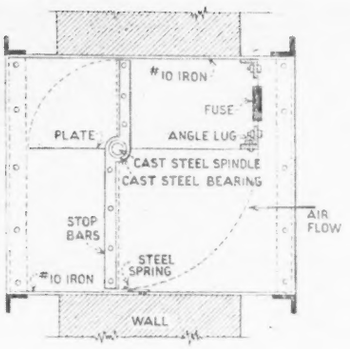

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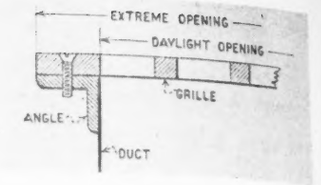
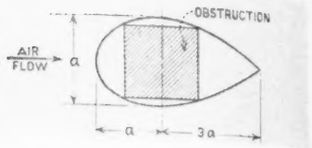




49

IN (46) is illustrated one type of hand volume or bypass damper. The leaf and spindle are inside the duct. One end of the spindle extends through the side of the duct and is fitted with a lever which engages a quadrant. The damper may be held in any position by means of a lock nut.

Fire Damper

The drawing in (47) shows a section through a common type of fire damper. Fire dampers are usually constructed of heavy gage black iron depending upon Underwriters' requirements. The damper leaf is mounted on a shaft that is set eccentric in the damper box to provide unbalanced weight to favor closing the damper by gravity when the fusible link gives way. The fusible link is made of a low melting point alloy usually fusing at about 120F. It should be noted that the damper closes in the direction of air flow and that there is a spring clip at the bottom of the duct and a stop at the top of the duct to prevent a reopening of the damper without manual attention. An access door should always be provided in the duct on the fusible link side of the damper to permit inspection and renewal of the link.

Outlet Opening

In (48) is illustrated an accepted method of forming of the outlet or inlet opening by the use of an angle frame. The register or grille is fastened to this frame just prior to the completion of the system, usually after the plaster work has been completed. If the grille is of unfinished metal, it is erected before painting and is painted along with the plaster surfaces. Finished grilles are usually applied after the general painting has been completed. Often the grilles or registers are fastened to a flange on the end of the duct, an angle iron frame not being required.

Streamlined Obstruction

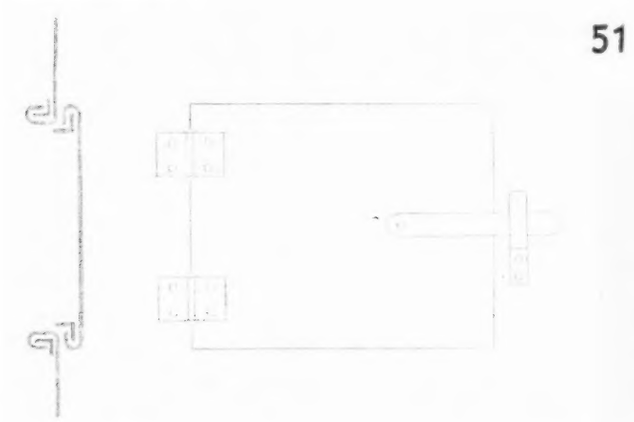
While it is not considered good practice to allow any obstruction in a duct, conditions sometimes permit hanger rods, small pipes, or the like. In such event, the obstruction should be streamlined, as indicated in (49). If the obstruction is relatively large it may be necessary to increase the cross-sectional area of the duct to prevent too great a friction drop in the section.

Access Door

One method of constructing an access door is shown in (50). The frames of both the opening and the door are made of angle iron. In order to make a tight joint between the door and the frame canvas-covered felt can be inserted between the turned-over edge of the sheet metal and the angle iron so that the projecting piece of felt will form a tight joint.

The initial ductwork from the fan discharge should be designed with a well-tapered transition to the trunk line of duct. Where possible, the taper should be about 1 in 7, as shown in (51). However, it is not always feasible to make such a connection, but in any case the ratio of 1 to 5 should be the maximum taper.

50



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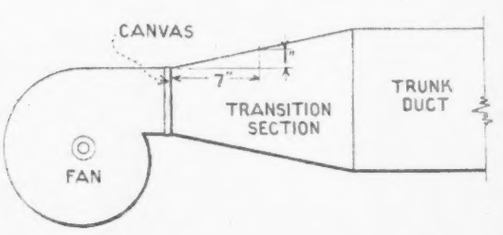


GETTING DOWN TO FUNDAMENTALS

Part 17—Approximate Heat Quantities for Preliminary Estimating

IN preceding installments in this series the fundamentals of making estimates of heat quantities arising from various sources have been discussed. In each case the available data have been presented and methods of applying the information have been outlined and illustrated. It has been noted in nearly all cases that the information is not complete and that its use calls for the exercise of a considerable degree of judgment. In spite of the existing shortcomings in both information and methods of application, it is generally felt that when the data are used thoughtfully and carefully, the resulting estimate produces a figure which can be used with a good degree of confidence.

While there is thus much to be gained in the way of a feeling of satisfaction when the full data are applied step by step and with thought and care, the objection to such methods is that they are time-consuming. Where much depends on the accuracy of the estimate, the time spent is probably well worth while because of the reduction in the likelihood of serious errors being introduced. However, there are cases where a fully detailed estimate of the heat quantity in either summer or winter work is simply not justified. For instance, there are cases where all that is required is an estimate which will come somewhere near the facts but which will not be used to make contracts or quote prices. Sometimes such a preliminary estimate shows that the proposed project is simply wholly out of the question and no further time need be spent in considering it. In other cases, the preliminary estimate gives sufficiently close figures to serve for budgeting estimates and to meet all needs up to the time when a detailed estimate is required. In some classes of work, estimators become so familiar with quantities that they need no more than a rule to go by and a keen sense of how the job varies from the average, in order to make their own deductions without resort to any formal calculations. Methods of making preliminary estimates are thus useful for a number of purposes and attention is now turned to some of them.

Winter Load Estimates

In the case of winter plants there are two shortcut formulas which have been in use for a long time. One is often credited to Mills, while the other is credited to Carpenter.

Carpenter's rule is perhaps the better known of these two rules. It is usually stated as:

$$H = \left[G + \frac{W}{4} + \frac{C}{55} \right] (t_i - t_o) \quad \ldots\ldots (1)$$

In which

H = Quantity of heat estimated, B.t.u. per hr.
G = Area of glass exposed, sq. ft.
W = Area of wall exposed, sq. ft.
C = Volume of filtration air flowing, cu. ft. per hr.
t_i = Temperature of indoor air, F.
t_o = Temperature of outdoor air, F.

It should be noted that values of t_i and t_o are those presented in an earlier part of this series of articles, while values of C were likewise discussed heretofore.

For most purposes the rule can be more conveniently applied by setting it up in the following form for 0F outside temperature and 70F inside, with an air change of 1½, which is typical for many buildings in winter.

$$H = 70\,G + 17.5\,W + 2\,V \quad \ldots\ldots (2)$$

In which

V = Volume or cubical contents of the room or building.

This puts the rule into a form perhaps more convenient for use than in its more general form.

It is interesting to note that for an air change of one, such as is sometimes used in estimating the heat requirements of residences and sheltered rooms in office buildings, the rule can be expressed as:

$$H = 70\,G + 17.5\,W + 1.25\,V \quad \ldots\ldots (3)$$

The other rule—commonly known as Mills Rule—is most usually written as

$$H = \left(\frac{G}{2} + \frac{W}{20} + \frac{V}{200} \right) 250 \quad \ldots\ldots (4)$$

and in this form is often referred to as the 2-20-200 rule. It can be readily simplified to the following form:

$$H = 125\,G + 12.5\,W + 1.25\,V \quad \ldots\ldots (5)$$

When the two rules are set up as in (3) and (5) it is interesting to note that the third term in each is 1.25 V. Examination in this form also shows clearly why the two rules do not give results which agree in most cases. However, they are both firmly entrenched in heating practice, give reasonably good results in many cases, and where the construction and materials are of the traditional type, they are useful. Where they become exceedingly misleading is in cases where either materials or constructions depart from those usually used. Thus, where there are well insulated walls, or where there are abnormal amounts of single glass area, or where filtration air is great in amount, the results obtained by using either of these rules may be grossly misleading.

In many cases, however, these rules give a result on the "safe" side or on the side which at once calls attention to any shortages of equipment. Thus, these rules are often much used in preliminary checkups to

learn whether oil burners or stokers or gas burners are set to handle approximately the right amount of fuel. They are also often useful in similar surveys to learn the adequacy of installed radiators, furnaces, boilers, and similar items.

In making estimates of winter heating requirements there are also a great many short rules and short forms which have been devised as time savers. In all of them some accuracy is probably sacrificed in order to save time. However, as there is no proof that even the most detailed calculation is correct, we have no way of estimating just how inaccurate these short-cut methods are. Experience of users points toward the conclusion that at least some of them are sufficiently accurate to meet the great majority of practical requirements. It is notable that many of them have been devised for use in estimating installations in small detached houses where occupancy is light and where there are few factors to disturb the routine.

One of these short methods with a form for use with it was described by E. A. Bailey in the June, 1934, issue of HEATING & VENTILATING. It is applicable to estimates of heat requirements for an entire detached house only and not to individual rooms.

TABLE 1.

APPROXIMATE HEAT LOADS IN SUMMER IN VARIOUS TYPES OF SMALL BUILDINGS

PERSONAL SERVICE SHOPS

Floor Space: Allow one chair per 90 sq. ft. of floor space for barber shops; one chair per 100 sq. ft. for beauty shops.

Hair Dryers: Allow 500 B.t.u. per hr. for each hair dryer.

Hot Water: Allow 200 B.t.u. per hr. per chair sensible heat, and 400 B.t.u. per hr. per chair latent heat.

HEAT LOAD PER OPERATOR'S CHAIR (B.T.U. PER HR.)

	10° COOLING	15° COOLING
Sensible heat	3000	3800
Latent heat	1000	1200
Total heat	4000	5000

SMALL PRIVATE OFFICES

HEAT LOAD PER CU. FT. OF COOLED SPACE (B.T.U. PER HR.)

S = SENSIBLE HEAT T = TOTAL HEAT	10° COOLING		15° COOLING	
	S	T	S	T
Surrounding Space Uncooled Top Floor				
Two exposures	5¾	7	7	8¾
One exposure	4½	5¾	5¾	7¼
One exposure, best conditions	2½	3½	3½	4¾
Intermediate Floor				
Two exposures	3	4	4	5¼
One exposure	2½	3¼	3¼	4¼
One exposure, best conditions	1¾	2½	2½	3½
Adjacent Floor Space Cooled Top Floor				
Two exposed walls	4¼	5½	5½	7
One exposed wall	3½	4½	4½	5½
One exposure, best conditions	2¾	3½	3½	4½
Intermediate Floor				
Two exposed walls	2½	3¼	3¼	4½
One exposed wall	1¾	2½	2½	3½
One exposure, best conditions	1½	2	2	2¾

RESTAURANTS

Floor Space: Allow 14 sq. ft. per customer chair.

No. of Occupants: Add employes to number of chairs.

Outside Air: Allow not less than 7 to 10 c.f.m. per chair.

Hot Food: Allow 30 B.t.u. sensible heat, and 30 B.t.u. per hr. latent heat, per meal served.

Coffee Urn: 1 burner, 10 gal., allow total heat of 12,000 B.t.u. per hr., of which 5,000 sensible and 7,000 latent. If fully ventilated and exhausted allow 2,500 B.t.u. per hr. sensible, no latent.

Steam Table: 1 burner, allow 1,500 B.t.u. per hr. of which 750 sensible and 750 latent. If fully ventilated and exhausted, allow 200 B.t.u. sensible, no latent.

Waffle Irons: Allow 75% of input rating. If fully ventilated allow 50% of input rating.

HEAT LOAD PER CHAIR (B.T.U. PER HR.)

Sensible heat	900
Latent heat	300
Total heat	1200

ROOMS IN RESIDENCES

ROOMS EXPOSED ON TWO OR THREE SIDES

HEAT LOAD PER CU. FT. OF COOLED SPACE (B.T.U. PER HR.)

S = Sensible heat T = Total heat	10° COOLING		15° COOLING	
	S	T	S	T
2nd floor room.	3	4	4	5½
1st floor room.	2½	3½	3½	5
Same, with surrounding rooms also cooled	2	2¾	3	4

SMALL THEATERS

Floor Space: Allow 7½ sq. ft. per seat.

Outside Air: Allow not less than 7½ to 10 c.f.m. of outside air per seat.

HEAT LOAD PER SEAT (B.T.U. PER HR.)

	10° COOLING	15° COOLING
Sensible heat	500	600
Total heat	800	900

Summer Load Estimates

In the case of summer plants it is often just as desirable to have available short, approximate methods of estimating as in winter plants. However, summer plants are much less widely distributed than are winter plants. Moreover, methods of making even the longer calculations are by no means fully agreed upon. There has been much less opportunity to develop short-cut methods for summer estimates or to test out in practice any which have been developed. Thus, while there is a considerable degree of confidence among practical men that they can make suitable use of short cuts in winter estimates, there is no similar feeling when quick methods are attempted in summer.

The problem in summer is complicated by the greater number of factors which affect the estimate. These have been enumerated before as sun heat; body heat; heat from lights, appliances, food, fuel, and similar sources; and heat from humidity in the ventilation air. These factors vary so much from time to time and between various building types that there is still no clear indication of their relation except that it is complex.

There are, however, several simplifications which can be made and information from experience gained in operating summer plants is slowly accumulating. Some of these points are worth mentioning.

In comfort work it is common to plan on cooling through either 10° or 15°. Many types of room require only 10° cooling, while in others 15° cooling is desired. There is question as to whether a greater lowering of the day bulb temperature than 15° should even be considered on the hottest days. Carpenter's rule can be set up to quickly calculate the heat transmitted through walls, glass, and by filtration air for each of these temperature differences, as follows:

For 10° cooling and one air change for filtration

$$H = 10\,G + 2.5\,W + 0.2\,V \quad \ldots\ldots (6)$$

For 15° cooling and one air change for filtration

$$H = 15\,G + 3.75\,W + 0.3\,V \quad \ldots\ldots (7)$$

While there are some short-cut rules for calculating sun heat by allowing a percentage of the transmitted heat, these rules vary so much in application that they are not repeated here. In the case of appliance heat, hot water heat, and heat from similar sources, there are no short cuts except as these are developed by experience.

In Table 1 are tabulated some suggestions as to allowances which may be made in certain classes of buildings. This table may be used to obtain an idea of what may be added to the quantities estimated by (6) and (7), or the heat load figures tabulated under each building type may be used without (6) or (7), if desired. Figures in Table 1 must naturally be used with care and discrimination. Enough experience has not accumulated behind them to remove elements of doubt. In summer estimates the safe rule is "In case of doubt, use the long method even if it takes more time."

U. S. Short 1,200,000 Homes, Statistician Estimates

A DIRECT shortage of roughly 1,200,000 housing units faces the country at the present time, almost 700,000 more call for outright replacement, and approximately 4,800,000 more require such drastic structural changes to make them livable that they would practically become new homes.

These figures are a portion of a study entitled "The Housing Shortage and the Demand for Homes," by William C. Bober, head of the statistical research department, Johns-Manville Corporation. Mr. Bober made use of the best available construction figures gathered during the last 10 years. It may be assumed, he says, that housing demand and supply were roughly in balance at the end of 1925, that over-building in relation to effective commercial demand developed from then on, followed in its turn after 1928 by drastic under-building in relation to the country's population growth. He carries his analysis through to the beginning of 1936.

In the last 10 years, he points out, some 3,000,000 housing units were built. But during that period approximately 700,000 homes were destroyed by fire and natural calamities such as floods, tornadoes, and the like. These homes had to be replaced and constituted part of the 3,000,000 homes built. This left only about 2,300,000 new homes built to satisfy an increase in the number of families of approximately 3,500,000. This leaves an initial deficit of new construction of about 1,200,000 homes. This back-log will sooner or later constitute an effective, commercial demand for homes, but not until purchasing power increases further through recovery.

But to the above figure must be added deficits of various other kinds. Using figures taken from the recent Real Property Inventory, Mr. Bober found that about 682,000 homes are so deteriorated that they call for immediate replacement, and roughly 4,800,000 more are so defective as to require radical alterations. Therefore, to the shortage of 1,200,000 is added a deficit of 5,482,000, making a grand total of around 6,700,000.

As Mr. Bober emphatically points out, this deficit merely represents a theoretical need for new housing and must not be misinterpreted as an active commercial demand. The latter is a matter of economics and purchasing power and also of the extent to which the taxpayer is willing to build homes through subsidy for the lower income groups of the population.

ENGINEERING NOTES

• Gas-Proof Shelters for British Firm

Work has been completed on a new London office building which is equipped with air conditioning and provisions for carrying on business during poison gas attacks. This is the first building to be so equipped in the United Kingdom.

A small underground shelter designed for underground control and direction of essential services has just been built and equipped with gas-tight and air-lock doors, gas-filtered ventilation and regenerated ventilation. The same firm which installed this job has also secured an order to build a shelter for 200 people. This shelter is being provided by the owners of a large block of new London apartments for the tenants. In all of these installations a special type poison gas filter is being used.

• How to Care for a Dust Control System

Dust control systems have, in the past, been subject to an unusual amount of neglect and disregard after installation. Possibly most of this is due to the fact that the installation in itself is non-productive, its chief function in most cases being the abatement of a nuisance. Many times also, the responsibility of upkeep has been shouldered onto an already overburdened millwright who, to keep actual production machinery in operation, has had to neglect the dust control installation.

The responsibility for the operation and maintenance of dust control equipment should be placed in the hands of a competent mechanic, who should make observations as pointed out below, either monthly or semi-monthly, and make dated reports in duplicate, with one copy for the plant manager, the other for his own records. The neglect of a seemingly unimportant and in itself inexpensive repair, may cause excessive damage to the installation and require a lengthy shutdown, not considering the loss of efficiency of the equipment during that time.

1—Inspect all hoods and piping for wear, structural damage, leaks, settlement of dust, etc. Note that slides fit tightly. Check glass gates for position and wear, inspect pipe supporting members.

2—Check pipe connections to collector housing for leaks, etc., also collector housing itself.

3—Watch fan bearings for wear and lubrication. Check for dust accumulation in fan housing or wear on fan wheel.

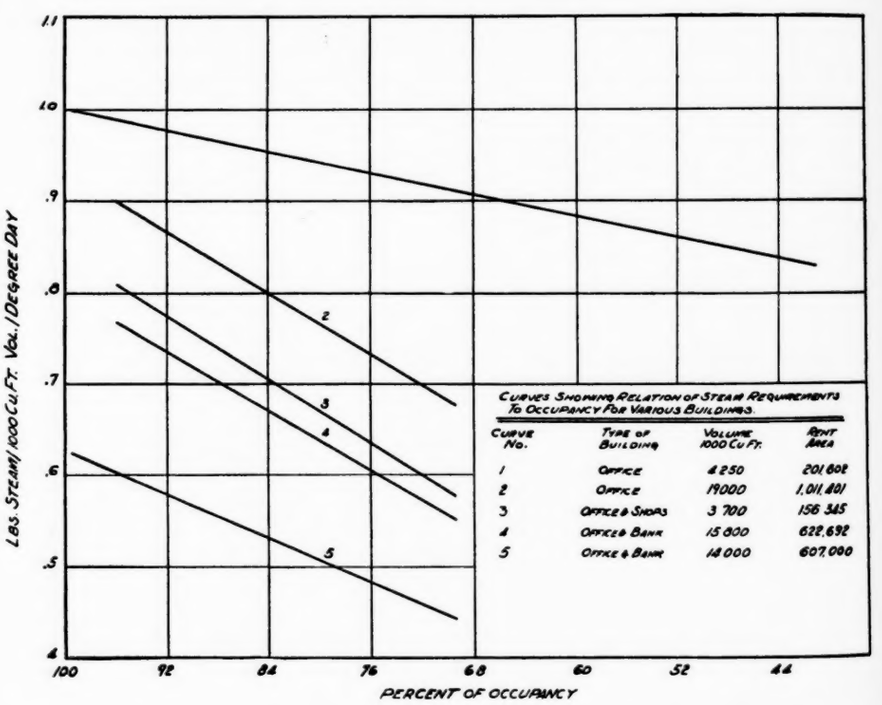
4—Enter clean air side of collector and with flashlight or extension light, check tube plates for excess dust accumulation. Check lubrication of shaking device. About every two months enter the dusty side of the collector, check the wear on baffle plates, etc., and note condition of tubes from inside.

5—Check suction and volume readings with pitot tube and manometer. Compare these readings with original test readings at time of installation. A test of collecting efficiency should be made semi-yearly by a competent individual using recognized technique in dust counting. Possibly your insurance connection includes this service—*C. A. Snyder, The American Foundry Equipment Co., Mishawaka, Ind.*

• Insurance Company Recommends a 68F Night Temperature

Don't sleep in a freezing cold bedroom or sleeping porch, particularly if you are one of the several million people now expecting the seasonal onslaught of sinus trouble, advises a health bulletin just issued by Northwestern National Life Insurance Company.

A bedroom temperature of 68F is cool enough for health, if proper humidity is maintained. If no humidifying device is used, the room should be kept a few degrees cooler. But with the blood circulation slowed by sleep, the bulletin warns, the nasal passages are poorly protected against bitter cold, which frequently starts irritation in the sinuses.

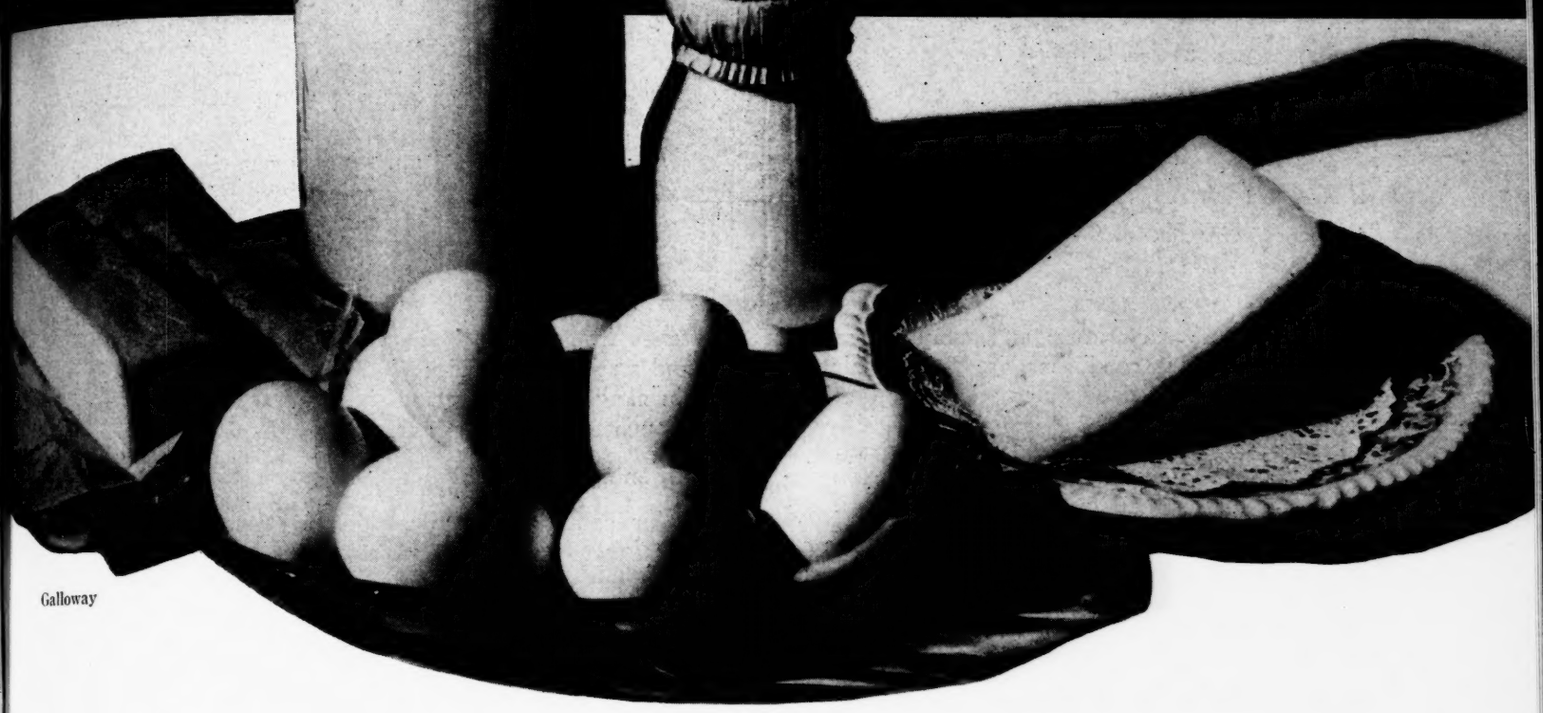


Relationship between per cent of building occupancy and unit steam consumption per degree-day for five typical buildings. This curve was submitted by one of the steam heating utilities in reply to a questionnaire by D. E. Washburn and incorporated in the report of the commercial relations committee of the NDHA., presented last spring at the Grand Rapids meeting.

AIR CONDITIONING IN INDUSTRY—

1—Handling of Foods

By MARY O. SOROKA



Galloway

PRODUCTION is based upon uniformity of both the raw material and the finished material in appearance, taste, quality, and performance. Food products are subject to this discrimination, but more important than this is the problem of handling and preserving perishable material. All vegetable and animal matter change with variations in temperature and humidity. Life processes continue through ripening and into decay, moisture is either given up by or is absorbed from the air and plant tissues produce heat as long as they are alive. Fruit dissipates body heat just as humans do and is also subject to frost bite.

Preventing the actual spoilage of foods is not the only purpose of air conditioning. Enhancing the market value through protection of the appearance and weight of foodstuffs which are sold by weight are equally vital problems, especially when complying with laws governing the allowable water by weight in products. There is a combination of temperature and relative humidity which is used in each operation, one combination for cold storage of eggs and another for incubation. The air conditioning of foods, like air conditioning for any other purpose, means the control of temperature and humidity with the provision of instruments to indicate how effectively the control is being carried out as well as cleaning and proper circulation.

The author is an engineer with Julien P. Friez & Sons, Inc., Subsidiary Bendix Aviation Corp., Baltimore, Md.

Precooling and Preheating

Precooling is the term used when produce is not loaded directly into refrigerated cars but is chilled slowly to remove field heat before shipment. For instance, in the case of citrus fruits the fresh, sun-ripened fruits are received at the packing plant within a few hours after they have been picked and are then placed in the precooling rooms to remove field heat. This prevents deterioration. The containers used for packing are held just above the freezing point as further protection.

It is often simpler and less expensive to cool perishables at collecting points before shipment than to produce the result during transit. Fruit temperature is reduced at the rate of 3.5F per hr. for wrapped fruit packed in boxes. After the fruit has been lowered to a temperature of 40F the cars are iced and shipped, and further icing is often unnecessary.

A lemon precooling plant in California is designed to maintain a constant temperature of 57F and a constant relative humidity of 90%. Thermostats and humidistats control all the equipment. As in most installations completely dependent upon control for successful op-

Photo courtesy Fruit Dispatch Co.

Checking the temperature controls in an air conditioned banana ripening room.

eration, graphic temperature and humidity recorders show that constant conditions are being maintained. Economies are effected by automatic operation in that advantage is taken of natural climatic conditions where possible in maintaining the desired indoor values.

Precooling is widely used for transoceanic shipping of fruits for world markets, especially from tropical ports. One plant in Portuguese East Africa has a capacity of 30,000 cases of citrus fruits at one time. Precooling is also done in transit by at least one producer who uses a refrigerator car with dry ice as a refrigerant. This saves an additional 24 to 36 hr. in the distribution of rapidly perishable produce.

When vegetables such as celery and lettuce are to be precooled, lower temperatures are employed. Some engineers have recommended 45F, and the cooling is brought about slowly, taking as long as ten hours to reach 45F from 85F.

Air conditioning for fruits and vegetables not only means precooling but preheating during transportation in excessively cold weather. Apples and potatoes must be shipped long distances without damage from freezing. The same type of equipment developed for precooling may be used to circulate the warm air.

Cold Storage

Cold storage conditions are different from the precooling conditions. For example, citrus fruits require a dry bulb temperature of 32F and a relative humidity of 80%. In cold storage, as in transportation, it has been found that uniform results are obtained by the mechanical circulation of chilled air.

Postcooling has been adopted by some companies with excellent results. After produce has been in cold storage, it is put into a room of 55F to 60F before distribution. The change from cold rooms to the heated interiors of stores in winter or to the outdoors in summer has resulted in losses from the breakdown of tissues. In addition, sweating occurs on packages and wrappers thereby reducing saleability.

Not only is storage used for preservation, but there is storage which cures or ripens fruits and vegetables. The method of curing fruit depends upon the type of market, bananas being cured for an immediate market and lemons for a future market. For bananas, the pulp starches must be converted and the skin colored and cured. The fruit is often cooled to a degree intended to keep the metabolic rate as slow as possible without injury. Ideal conditions are said to range from 56F to 70F. Lemons require 54F to 59F and a relative humidity of 87% to 90% to secure least shrinkage and to develop the rind so it will be tough enough to stand shipment.

Ripening and Coloring

Air conditioning makes possible the ripening and coloring of bananas and tomatoes by ethylene gas. Coloring or sweating is the trade name for artificial ripening. The citrus fruits — oranges, lemons, and grapefruit—require oxygen as do human beings and cast off carbon dioxide. Advantage is taken of this in coloring the citrus fruits in the use of the ethylene process. About ¼ cu. ft. of ethylene gas is used to color 1,000 boxes of lemons; one-half cubic foot per 1,000 boxes is needed for grapefruit and 1 cu. ft. for 1,000 boxes of oranges. During the coloring the carbon dioxide content of the room must be less than 2% by volume since the presence of too much CO_2 retards the chemical process. During the process a temperature of 70F is maintained in rooms where lemons are being colored and 75F in rooms handling grapefruit. The amount of water vapor is kept higher during coloring as well as in storage, and air movement helps diffuse gases and vapors. It is essential to keep the temperature constant with great accuracy since upon this feature the uniformity of the product depends. Automatic recorders for checking conditions should be employed where possible, but if this method is too expensive, sling psychrometers may be used instead.

Rot Prevention

The U. S. Department of Agriculture has been conducting tests to check the development of rots and to reduce the rapidity of the softening of the fruit. As a means to this end, carbon dioxide treatment for the precooling of peaches, strawberries, and other small fruits is being tried for improving conditions in transit. Some fruits stand this treatment better than others, but apricots, peaches, strawberries, and red raspberries are

easily injured by concentrations above 25%. Grapes, sweet corn, carrots, peas, plums, apples, cherries, pears, oranges, and currants show tolerance for higher concentrations of the gas. The first objectionable effect of this method is a slight loss of aroma, and with prolonged or severe treatment, a loss of flavor occurs. It is the opinion of experts that any inert gas in sufficient concentration to prevent oxygen respiration by the fruit will eventually produce abnormal function or injury.

Egg Storage

Stored eggs lose weight because their natural moisture is absorbed by containers, walls, or racks. Today storage rooms are humidified, not only to reduce shrinkage in the eggs, but to preserve flavor also. Eggs are stacked so as to be surrounded by 1 in. space on all sides to provide for circulation of air. Recommended conditions for egg storage are often placed at 30F dry bulb and 80% relative humidity.

Before the advent of automatic control, it was the custom in egg storage warehouses to sprinkle the floor or to hang up wet blankets and let them dry out. Other makeshifts were practiced, such as using an electric heater to evaporate moisture from a cloth immersed in water, or blowing low-pressure steam into a room. There are many units on the market today which produce moisture in the air efficiently by introducing in the discharge of the fan a quantity of water which is broken up into a fine mist. These are all steps in the right direction but indiscriminate tampering without proper control may mean moldy shells and cases. More moisture is needed in the first month of storing since in that time the cases and fillers will have absorbed all the moisture they are capable of holding. This is another indication of the benefits to be derived from air conditioning as opposed to merely raising the humidity without control. In some instances, eggs have been stored in cooled cases, a tremendous advantage since the absorption of moisture is curtailed sharply with lowered temperatures.

Ice Cream Production

In the production of ice cream, it has been found that the use of conditioned air in the hardening room has made the hardening of ice cream faster, cheaper, and easier. In one plant, defrosting of ammonia pipes was a laborious process which meant the loss of the use of the room because of the mess of water on the floors as the ice fell off. The ice cream then had to be removed to another room. Upon the installation of air conditioning this condition disappeared and not only was it found that odor and dampness were also done away with, but the air conditioning equipment occupied less space than the older cooling equipment. Soggy floors and excess dampness on stored cases and walls in other rooms are often the result of lack of adequate circulation. The drip of condensation from the walls and ceilings of the pasteurizing room can be avoided by the use of air conditioning, and there is no reason why the entire interior of a plant should not be sweet, clean, and dry.

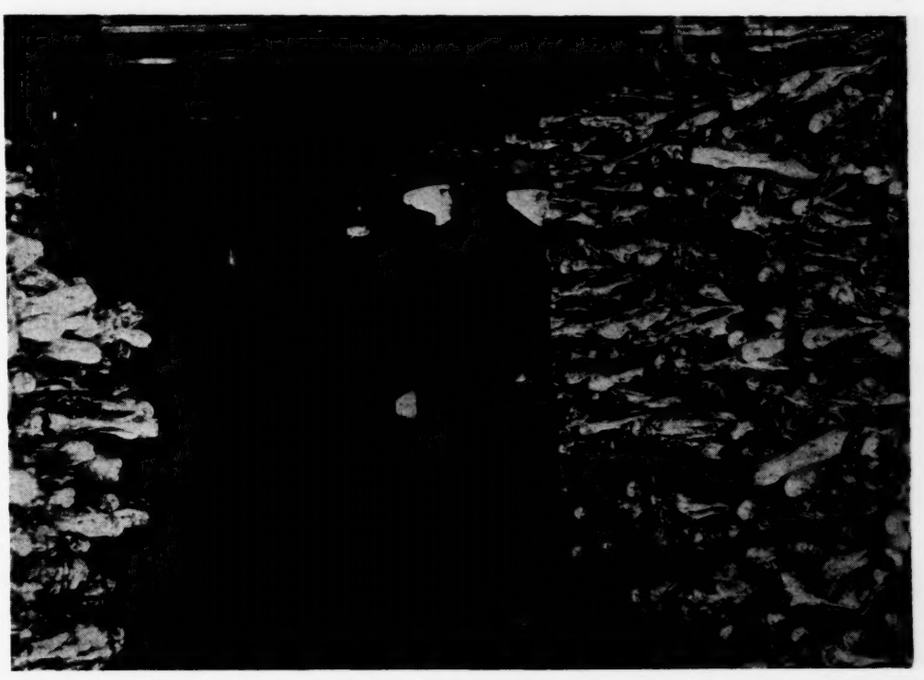
Shipping and Storing Meat

Meat shippers have been troubled by the serious problem of loss in weight of stored meats. This problem was solved temporarily by greatly increasing the relative humidity. However, the more rapid development of bacteria and molds due to the greater moisture offset the advantages. For the storage of meats, temperatures of 0F to 10F and a relative humidity of 50% are recommended in some textbooks.

Aside from the preservation of meats the processing and curing of meats also utilizes controlled air conditioning with a resultant improvement in appearance and texture. Dry, clean air in the killing room means that the carcass will chill down more uniformly and therefore more quickly. One of the dangers of chilling a carcass before it is dry is the fact that it will harden on the outside because of the freezing effect of moisture and prevent uniform chilling to the bone.

Meats that are taken from the smoking ovens at about 110F are sent to air conditioned rooms where a temperature of 68F with a relative humidity of 70% is maintained. As the meat is chilled down to the proper condition for packing and shipping, the controlled humidity prevents the loss of moisture content, eliminates shriveled appearance, and prevents softening of the fats. This even condition is accomplished by means of a humidistat which controls the operation of

Photo courtesy "Food Industries."



For the storage of meats a temperature of 0–10F and a relative humidity of 50% are recommended.

the sprays and thermostatic valves which control the flow of brine through the cooling coils giving independent control of temperature and humidity. Instead of ordinary refrigeration, conditioned air is now being used in sausage coolers, beef boning rooms, and pork cutting departments.

The use of conditioned air for chicken incubators is well known and widely practiced. Temperatures for this purpose vary from 99F to 102F and relative humidities range from 55% to 75%.

Candy-Making

Another illustration of the complete dependency of a product upon the ability to keep each step of manufacture in the narrow, defined condition best suited to it, is candy-making. To begin with, perishables like raisins, nuts, dried milk, and similar materials are stored in air conditioned rooms. In manufacturing, the centers are precooled in separate rooms to about 68F before being coated by hot, liquid chocolate. The coating of chocolates by machine is done in a room in which the dry bulb temperature is around 85F in order to keep the chocolate fluid. The chocolates are then conditioned by passing them through a tunnel in which the air is delivered at 40F. Packing rooms are maintained at a temperature of 60F dry bulb and 50% relative humidity. Storing the packed product in an air conditioned room prevents the chocolate coating from getting soft and turning color and prevents hard candies from becoming sticky. The wide differences in the required air conditions in each room are maintained by automatic controls. Even storage of canned products can be improved by conditioning which prevents corrosion of tin cans and spoiling of wrappers.

This is the first of a series of articles dealing with the application of air conditioning to various industries.

Advertising District Heating

ADVERTISING of district heating is a problem and deserves cooperative study. The heating companies are in need of a solution and certainly the manufacturer of materials has a common interest in some agreed plan of publicity. Yet district heating does not get publicity. It is not advertised, either by the operating company or by the manufacturer. All other departments of the utility business—water, gas, and electric service—are given publicity, from the billboard to the program in the theater—but not heating.

It is not for the lack of an interesting story. The fact that the Christian Science group of buildings in Boston, some two miles from Kneeland St., is heated from that station, is nothing short of amazing to the public. That turbines are operated in the Eli Lilly plant at Indianapolis, 6000 ft. from the steam generating station, is drama of the first order. Is there not like material for publicity of your own system?

The manufacturer's publicity depends upon the operation of your heating company. If the heating system is profitable, the manufacturer can refer to these successful plants; if they are not profitable, the manufacturer can do little to give publicity to district heating. District heating is profitable in a preponderance of cities where operated. Steam sales contribute both income and service to practically every department of the utility. Since district heating makes these contributions to the financial success of the company, why is it not given publicity?

District heating is not advertised because it is used as a "means to an end"; it is the medium by which the electric department is boosted into the profit column—which is fine for the electric department, and fine for the principals of the operating company. It is not fine for you—district heating men—and it certainly is not helping the manufacturer of heating materials.

I believe that district heating can be advertised, just as the electric departments advertise their business. But first, the heating department should get their house in order. Is it not true that in the last analysis your heating business divides itself into two, possibly three, parts, so far as contracts are concerned? First, there is your heating contract based on a rate which is right. Second, there is the heating contract not financially profitable to the company, but for which the heating department is entitled to credit from the electric department. Third, the contract which for some reason is wrong and should be corrected. If all your heating business was contracted under the first suggestion, your company would advertise and "tell the world" it was a good business. It is a good business under the second suggestion, for the electric division has secured profitable contracts due entirely to it being possible to supply steam service. If your department were to receive proper credit or real money for this service, you would advertise district heating.

If you would study to correct the contracts in the third part of your business—the contract which for some reason is wrong and should be corrected—this situation would gradually be improved. There are in every company contracts which can be improved. I know of one contract where the rate for current was above reproach, while the rate for steam was 25 cents per 1000 lb. This contract operated for nine years and has recently been corrected, with no loss of business and a steam rate now of 65 cents per 1000 lb.

To one outside of the utility families it appears that some internal organization advertising might not be amiss. In other words, are you selling your steam heating department within your organization as well as to your customers and prospective customers? Your department must thrive, and this can only come when it is recognized within your company as a sound source of revenue. I believe it would be possible for every heating manager to review again and again the contracts he has for steam service, and to gradually improve these contracts. Perhaps the manufacturers can help your company improve these contracts, which in time would permit them to advertise the business of district heating.—*H. C. Kimbrough, in an address before the annual meeting of the Boston section, National District Heating Association.*

EDITORIALS

Studying the Atmospheric Air

Studies on the atmospheric air and applications of air for many purposes continue at a rapid rate. Scarcely a month goes by when some new studies or some new applications do not come to light. Recently our attention has been called to studies now under way to collect and correlate what is known about the effects of air on occupational diseases. Another project aims to gather new and heretofore unknown data about dust in air in urban localities of varying characteristics. These came on the heels of announcements that the influenza virus has been proved to be air borne. At least two new procedures for applying air conditioning to the treatment of diseases are receiving active study. All these are fact-finding procedures. Their direct applications are still experimental and open to conjecture, but it can be predicted that the facts uncovered will find their way into practice in some way with just about as much certainty as to predict that day will follow night. We now know the cycle perfectly well. "First study, then apply" has been a fundamental rule of engineering for a long period. Unfortunately, the atmospheric air and its application received altogether too little really intelligent study in past years. No doubt the popular interest in air conditioning for comfort has had much to do with causing students to start examining the atmospheric air with an intensity not exhibited before. No wonder students find the subject so entrancing and no wonder that those already in the heating, ventilating, and air conditioning industry watch these studies and applications with unending interest. Some of these days we are going to be working with the very facts now being found.

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Automatic Heating Wins

Outstanding in all reports of activity in the application of equipment for a long period of months has been the strong upsurge in all the automatic and semi-automatic burners for use in residences. There is no doubt now but that residential heating is going to be automatic or at least automatic to an extent which greatly reduces the ordinary attention so long necessary. In other words, the sales appeal of reducing the personal attention required with the heating plant has now taken effect. Behind it all lies a long story of development of equipment, of pioneering to find suitable methods and materials, and of aggressiveness in finding ways of marketing, all at steadily reduced costs to the purchaser. These efforts are still going on, and while they lead to confusion and adjustments within the industry, and even though they give rise to violent differences of opinion as to the nature of their final results, there is every reason to believe that the future of automatic operation of residence plants will grow and expand. This will be true not only in terms of sales but also in degree. Having secured some degree of release from the necessity of tending a fire, the natural and human instinct is to accept gladly any advances which permit increasing this pleasure.

But the past few years also saw a most extraordinary activity in developing other new mechanical equipment for home use. Nearly all of it too was intended to appeal to the desire to be relieved of personal effort in keeping a house going. There were even attempts to make the actual construction of houses free from personal effort. Never has there been such a concentrated and determined effort made to devise mechanical and electrical equipment for home use or such strenuous efforts to popularize it. Gadgets have come along in bewildering array until there seems no end to the procession. Resources have been stretched to help price appeal and generally nothing has been left undone to advance these devices in a market which approaches cut-throat tactics. It is especially noteworthy that automatic heating equipment has progressed steadily while being compared with all these competitors for a part of the homeowner's dollars. Out of everything which has gone so hopefully to this market in this period no class of equipment has made out better than that which brings the purchaser some freedom from fire-keeping for a considerable part of the year. There is no better proof of the place it has earned than to have passed this test. Automatic heating in residences has made the grade, has proved its case, and the engineer has occupied a key position throughout its advance. He now has opening before him an even greater opportunity than ever to extend and solidify the position gained.

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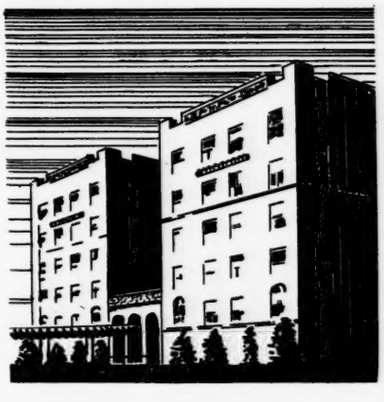
Cooled Apartment Houses

Summer cooling for apartment houses would seem to hold possibilities since apartment houses are frequently located where there is no natural shade and in densely built-up sections. In spite of this it is only recently that any but the pioneer installations have been put into apartment houses. Recently, however, with the revival in activity in building new apartments a number of installations of summer cooling equipment are reported. Several of these have been described in recent issues of HEATING & VENTILATING because of their novelty and because readers are interested in noting what methods are being used. No uniformity in plan has developed as yet, although there is plenty of reason for believing that the practice can and shortly will be at least partly standardized. Apartment houses have frequently led in incorporating the equipment which is later widely accepted in other types of residential building. For instance, the apartment house early adopted the idea of doing away with ice deliveries, accepted the compact kitchen, the small bathroom, and the idea of small rooms with a minimum of waste space. All these pleased the prospective apartment house dweller and were decidely useful talking points. They were not developed fully overnight but all of them resulted from paying close attention to the arrangement of equipment already well known. The whole problem was to adapt existing equipment to the peculiar needs of the apartment house. Once this was solved acceptance followed rapidly. The early installations now being made in apartment houses are all attempts to adapt existing summer cooling equipment to the problem at hand. Once the soundness of these arrangements is demonstrated we shall see apartment houses of the better class rapidly accepting summer cooling. It is quite possible that the methods used will sharply affect the methods for accomplishing summer cooling in detached residences. This is why these early apartment house installations are being watched so closely by the whole industry.



ABSTRACTS of Current Papers, Books and Pamphlets

Handbook of Engineering Fundamentals

This is the first volume in the new Wiley Engineering Handbook series. This series of handbooks includes besides this volume on engineering fundamentals one on power, another on design and shop practice, a fourth on electric power, and a fifth on communication and electronics. All of these books except the first volume on fundamentals represent complete revision of former Wiley handbooks. The second and third volumes on power, and design and shop practice represent the 11th edition of Kent's Mechanical Engineers Handbook, while the fourth and fifth volumes of this series are revisions of the Handbook for Electrical Engineers by Pender, DelMar, and McIlwain. All of these volumes are of the same size and have the same type binding. The large size of paper makes possible the use of larger type, illustrations and diagrams.

This first volume is designed to present a complete summary of the facts pertaining to the fundamental theory underlying all engineering practice. It contains a treatment of mathematics, applied physics (including electricity, mechanics, and thermodynamics), and chemistry. The book is divided into 13 sections. The titles of the sections are as follows: 1—mathematical and physical tables; 2—mathematics; 3—physical units and standards; 4—theoretical mechanics; 5—mechanics of materials; 6—mechanics of fluids; 7—engineering thermodynamics; 8—electricity and magnetism; 9—radiation and light, acoustics, and meteorology; 10—chemistry; 11—metallic materials; 12—nonmetallic materials; 13—standards.

[*"Handbook of Engineering Fundamentals," by O. W. Eshbach, editor-in-chief. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York. Flexible binding; 5⅝ x 8⅝ in.; 1081 pages. Professional edition, price, $5; college edition, price, $4.*]

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Kent's Mechanical Engineering Handbook

The 11th edition of Kent's well known handbook for mechanical engineering appears in an entirely new form. The page size has been enlarged so that more material can be placed on each page and the book is now divided into two volumes. The first volume deals with the entire field of power while the second covers design and shop practice. These volumes may be purchased either separately or in combination. This review deals exclusively with the power section as the second section will not appear until the early part of 1937.

There are 17 sections as well as a complete index in the Power volume. Some idea may be gained of the scope of this volume from a brief mention of what is included in the various sections. For instance, Section 1, Air, includes not only a description of the properties of air, but a discussion of the flow of air and a full treatment of air compression, including fans and blowers. Section 2, Water, covers the fundamentals of hydraulics, including material on flow of water, turbines, pumps and pumping engines. Section 3, Heat, offers complete handbook treatments of the measurement of heat, heat transmission, evaporators and evaporation, dryers and drying, heat insulation and thermodynamics. A section on Combustion and Fuels follows covering the principles of combustion, solid fuels, liquid fuels, and gaseous fuels.

Section 5 gives the information concerning steam, with extensive data as to its properties, steam piping, and steam valves. Section 6 applies these principles of the action of steam to the steam boiler and gives an excellent treatment of chimneys and draft. Section 7 follows with a discussion of important data concerning the steam engine, while Section 8 covers fully the types, performance, etc., of the steam turbine. Section 9 deals with Condensing and Cooling Equipment, and Section 10 with Refrigeration and Ice Making.

Section 11 presents a complete summary of essential information in the field of heating, ventilating, and air conditioning. Much space is given in Section 12 to a discussion of internal combustion engines, including diesel, gas, and gasoline engines. Gas producers receive full attention in Section 13. Section 14 is entitled Transportation, while Section 15 gives a brief summary of the fundamentals of electric power. Power test codes are discussed fully in Section 16, not only as to instruments and apparatus but also as to test codes themselves. The final section gives a complete set of mathematical tables of importance to the mechanical engineer.

[*"Mechanical Engineers Handbook," Power Section, 11th revised edition, by Robert T. Kent, editor-in-chief. Published by John Wiley & Sons, New York. Flexible binding; 5⅝ x 8⅝ in.; 1254 pages; price, $5.*]

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Dust Disease in the Cotton Industry

This report deals with an investigation of respiratory dust disease in operatives in the cotton industry. The handling of cotton in its early stages, especially in the process known as carding, is inevitably a dusty occupation. When the compressed bales of raw cotton arrive in England from the plantations, much dust still remains mixed with it and has to be removed in a series of processes, preparatory to spinning the material into yarn. Important among these are the processes carried out in the blowing or scutching room, in which partially loose masses of cotton are thoroughly separated; and in the carding room, where the cotton is subjected to an intensive teasing action, by which its hairs are combed into a parallel arrangement and removed in the form of a filmy rope.

A recent report of the Committee on Dust in Card Rooms in the Cotton Industry concluded that the dust in card rooms is a cause of some discomfort and ill-health due to respiratory disease among operatives. They found that the main effects can be considered in three stages, which gradually merge as the malady progresses. The first evidence of the condition, when it occurs, consists of symptoms of irritation, particularly cough and a feeling of constriction in the chest, but these pass off on removal from the dusty atmosphere. After ten or more years' work the effects may become more persistent, with periods of incapacity, at first short and infrequent but tending to become more prolonged and to occur at shorter intervals. Cessation from work in the dusty atmosphere at this stage is generally followed by recovery, or at least by sufficient improvement to permit of work in another atmosphere. Finally, a stage may be reached in which there is total incapacity for work, with signs of chronic bronchitis and emphysema, and a strain on the heart which is apt to lead to cardiac failure.

In the present report Professor Prausnitz shows how he studied the problem of "strippers' asthma" from many angles, so that he was led ultimately to the view that there is a specific agent in cotton dust capable of producing the observed symptoms and ultimately the pathological changes in the lungs. He has shown the strong probability that this substance, or group of substances, is contained in the protein fraction of the dust and is responsible for the changes which may occur in the lung after prolonged inhalation.

It seems clear from the results obtained that there is only one method of overcoming this disability of the cotton industry, and that is by preventing access of the finest dust to the respiratory tract. It would appear that the ventilating and exhaust appliances which are now generally

in use, although they remove the coarser particles of cotton dust from the atmosphere, do not in fact prevent access to the worker of the finer particles which are particularly liable to produce intense irritation of the respiratory system in those susceptible to the dust. The Council says that now that this essential fact is established by Professor Prausnitz, the practical problem seems to rest on the need of discovering a method of removing these finer particles. The ingenuity of the engineer ought to have relatively little difficulty in solving this mechanical problem and so eliminating an important cause of ill health among industrial workers.

[*"Investigations on Respiratory Dust Disease in Operatives in the Cotton Industry," by C. Prausnitz. Published by the Medical Research Council, London. Paper cover; 6 x 9½ in.; 82 pages; price, 2s. 6d. net. Obtainable in the United States from the British Library of Information, 270 Madison Ave., New York, price, 80c.*]

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Selling Radiator Heating

Countless volumes have been published on the design and installation of radiator heating systems during the three-quarters of a century that this form of central heating has been in use but, although the technical books have been many, books dealing with the marketing and sales problem of this particular industry have been rare indeed. A volume just published, under the authorship of the advertising manager of one of the oldest companies in the radiator heating business, is therefore a distinct contribution to the literature of the industry.

The name of this book is "Selling Radiator Heating to the Homeowner" and its avowed purpose is to describe some of the methods that have proved successful among progressive heating contractors in helping to make sales in the face of stiff competition and unsettled business conditions. The book is offered to heating contractors as a source of practical suggestions and ideas that will help to provide an answer to many every-day selling problems.

Among the subjects covered are: prospecting for new business, including the making of heating surveys of the contractor's community; a discussion of merchandising, from the standpoint of what the prospect's needs are and how they can be met; making the sale and one covering the objections most frequently encountered on the part of the customer. Other subjects covered include those on competition and ethics, service and management.

[*"Selling Radiator Heating to the Homeowner," by Graham Bruce Ford, advertising manager, Richardson & Boynton Co. Published by The Carr Co., New York. Cloth bound; size 5½ x 8¾ in.; 209 pages; price, $3.75.*]

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Handbook of Chemistry and Physics

The 21st edition of this well known book contains 175 more pages than the last edition. Besides the new material presented in these pages, a number of older sections have been changed considerably. For instance, the numerical tables in the mathematical section appear in a new and improved form. The first section of these tables gives reciprocals and the circumferences and areas of circles while the second part is devoted wholly to squares, cubes, and roots and all values are given to at least seven significant figures.

This edition in general follows the previous one in that it is divided into five sections. These divisions are as follows: 1—mathematical tables; 2—properties and physical constants; 3—general chemical tables; 4—heat, hydrometry, sound, electricity, and light; 5—quantities and units and miscellaneous tables. There are approximately 154 pages on heat, 20 pages on hydrometric and barometric tables, and 7 pages on data on sound absorption.

[*"Handbook of Chemistry and Physics," 21st edition. Published by The Chemical Rubber Co., 1900 W. 112th St., Cleveland, Ohio; flexible cover; 4¼ x 6½ in.; 2023 pages; price, $6.*]

Wrought Iron

An increasing use of wrought iron in many products has, according to the authors of this book, lead to an increasing demand for reliable information on the qualities and applications of this material. The purpose of this book is to supply information to fulfill this need.

The book has been written so it can serve as a source of up-to-date information on wrought iron for such men as engineers, architects, contractors, and others who have the occasion to specify the material. The three chapters which will probably be of greatest interest to engineers and contractors are entitled The Characteristics of Wrought Iron, Principal Applications for Wrought Iron, and Material Selection. In the chapter on characteristics of wrought iron is a discussion of the reasons for the durability of the material when subject to corrosion and shock or constant vibration. Also discussed in this chapter is the welding, forming, machining, and treating qualities of the material. A list of the wrought iron products now available is presented in the chapter entitled The Principal Applications for Wrought Iron. A discussion of the factors that must be taken into account in selecting a material such as wrought iron is included in chapter on material selection.

[*"Wrought Iron, Its Manufacture, Characteristics, and Applications," by James Aston and Edward B. Story. Published by A. M. Byers Co., Pittsburgh, Pa.; cloth cover; 6 x 9 in.; 59 pages; price, $1. Available free on request on business stationary.*]

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Brief Reviews

LORD KELVIN. A biography of the life of Lord Kelvin, the English scientist. [*"Lord Kelvin, Master of Heat and Cold." Published by Temperature Research Foundation of Kelvinator Corp., 420 Lexington Ave., New York. Paper cover; 6 x 9 in.; 8 pages.*]

INSULATION. A discussion of the principles of insulation in house-heating. [*"Insulation in House-Heating," by W. W. Cullin. Miscellaneous report No. 14, published by Committee of Ten—Coal and Heating Industries, 307 No. Michigan Ave., Chicago. Mimeographed; 8½ x 11 in.; 6 pages.*]

HEAT INSULATION. This paper presents a rational method for the determination of the correct thickness of insulation to apply in order to prevent sweating, and also gives useful tables and graphs for the calculation of heat transmission from objects at sub-zero temperatures, as well as for objects above room temperatures. [*"Heat Insulation In Air Conditioning," by R. H. Heilman. Published in Industrial and Engineering Chemistry, July, 1936, pages 782-786.*]

VALVES AND FITTINGS. A new edition of the Manufacturers Standardization Society standard practice on marking systems for valves, fittings, flanges, and unions. The method of applying the general rules for marking is more specifically visualized in this new edition by the inclusion of a number of tables outlining the standard method of applying uniform markings to a wide variety of products. [*"MSS Standard Marking System for Valves, Fittings, Flanges, and Unions." No. SP-25-1936, published by the Manufacturers Standardization Society, 420 Lexington Ave., New York. Punched for loose-leaf; 8½ x 11 in.; 17 pages; price, 50c.*]

COLLOIDAL FUEL. This paper attempts to give a concise description of all colloidal fuel processes now available. It defines colloidal fuel as a mixture of finely pulverized coal or other solid fuel and a liquid fuel such as petroleum oil, coal tar, lignite tar, or shale oil fractions, in such a condition that the solid particles will not separate out by gravity for a long period. Discusses the methods of manufacture and nature of colloidal fuel, describes 13 types of colloidal fuels. [*"Colloidal Fuel, Description of Different Processes," by David Brownlie. Published in Industrial and Engineering Chemistry, July, 1936, pages 839-842.*]

NEWS OF THE MONTH

Bluth Addresses Illinois Mining Institute, Speaks on Coal Industry's Opportunity

SPRINGFIELD, ILL.—Over 42% of the stokers sold last year were sold in the territory comprising Illinois, Wisconsin, Michigan, Ohio, Pennsylvania, Indiana, Iowa, Minnesota, Missouri, and Nebraska, according to Marc G. Bluth, executive secretary, Committee of Ten, Coal & Heating Industries, in an address before the 44th annual meeting of the Illinois Mining Institute held here October 23. The subject of Mr. Bluth's address was The Coal Industry's New Opportunity.

Mr. Bluth's talk indicated that, although the stoker industry has shown spectacular gains in business it is not going to be self-satisfied about it. The speaker deplored the fact that not enough homes have stoker-fired equipment and said "I am deeply disturbed when I learn that a survey conducted by an independent, reliable agency disclosed that of 500 new homes built this year in an eastern city only two were constructed so that coal could be used as the fuel. A check of 75 homes in Detroit shows that not one single stoker installation was made. In 117 new homes built in Madison, Wis., this year, only one coal bin was specified. In 600 new homes built in Milwaukee during the last two years, only 25 coal-burning boilers and stokers were installed. In the city of St. Paul in 1935 over 1000 oil burners were installed and most of these were a combined boiler-burner unit. The pitiful part of this story is that the initial investment which a buyer makes in a combined unit for oil or gas is so high that he is very hard to convince that a change over to coal is the economical thing to do. I have kidded myself during the past few years, and others in the industry have also kidded themselves, that an oil burner installation or a gas burner installation is easy to convert to automatic fired coal when the sales presentation is properly made. I must confess that this opinion which I held has been knocked into a cocked-hat. Why? People don't buy oil burners or gas burners for economy. They buy for convenience, comfort, cleanliness, and sometimes from sheer downright laziness."

Addams Heads Boilermakers

CLEVELAND—Homer Addams, president, Fitzgibbons Boiler Co., was elected president of the Steel Heating Boiler Institute at a meeting of the Institute held here October 6. Vice-presidents elected were C. N. Tull and J. F. Johnston. R. A. Locke continues as secretary and treasurer.

The board of directors is made up of Messrs. Addams and Tull and the following: J. R. Collette, vice-president, Pacific Steel Boiler Div.; C. L. Crouse, vice-president, National Radiator Corp.; R. B. Dickson, president, Kewanee Boiler Corp.; J. T. Dillon, Jr., president, Titusville Iron Works; F. B. Metcalf, president, International Boiler Works; H. H. Peek, president, Lookout Boiler & Mfg. Co., and J. C. Trefts, president, Farrar & Trefts.

Boston Adds 3 A.C. Jobs

BOSTON—A total of 234½ hp. was added to Boston Edison's connected load for air conditioning installations during September. These numbered three, the largest one of 225 hp. being for completely air conditioning the banking house of Harris, Forbes & Co. The Copley Plaza Hotel installed a 3½ hp. plant for its new cocktail bar and the Kay Jewelry Co., which already had air conditioned its Boston store, put a 6-hp. system in its Waltham store.

502 New Movie Theaters in 1936

NEW YORK—A total of 502 motion picture theaters will be erected in the United States during 1936 at an aggregate cost of $26,120,200, according to *Boxoffice*, film trade journal. Covering the first nine months, the survey indicates an addition of 286,716 seats to the nation's 11,000,000 theater capacity.

The following figures for theater construction, released recently by the U. S. Department of Commerce, afford a comparison:

1932	$17,500,000
1933	13,500,000
1934	20,000,000
1935	21,500,000

Results of the survey therefore indicate that reports for the first nine months of this year exceed the total of any entire year since 1931. During 1931, theater construction totaled $45,000,000, a drop from $97,580,000 in 1930 and $163,559,000 in 1929. A total of $378,000,000 was spent on theater construction from 1929 to April, 1936.

A. C. for N. C. & St. L.

NASHVILLE, TENN.—The board of directors of the Nashville, Chattanooga & St. Louis Railroad has authorized an outlay of $123,377 for air conditioning all coaches of the line by April, 1937. At the same time the board approved arrangements with the Pullman Co., to air condition sleeping cars also.

Oil Burner Show to Be at Philadelphia

NEW YORK—Philadelphia has been selected as the site of the 1937 oil burner show, to be held during the week of March 15-19. The exposition will be held in the Municipal Auditorium.

The selection of the convention city was made by the board of directors of the Oil Burner Institute at their meeting in Atlantic City October 20, following a report submitted by Lionel L. Jacobs, chairman of the sales promotion and public relations committee of OBI.

According to G. Harvey Porter, managing director of OBI, the 1937 event will be known as the National Oil Burner and Air Conditioning Exposition, the words "air conditioning" having been added in recognition of the position occupied by the oil burner in the field of winter air conditioning. Mr. Porter also stated that the board of directors ruled that it will be necessary for exhibitors of oil burners and accessory equipment to be members of the Institute.

Mr. Porter submitted to the board a plan for the appointment of a joint committee of OBI and Air Conditioning Manufacturers' Association, the purpose of which is to embrace mutual problems and related interests in such objectives as the marketing of allied products, public, trade, and builder understanding of air conditioning, as well as other mutual objectives that would develop from time to time. Members of the committees appointed by ACMA and OBI will be announced later.

More Coal Heat Shows Scheduled

NEW YORK—Anthracite Industries, Inc., announces that during the year it will conduct four more shows on a scale comparable to that of the Springfield show at the Eastern States Exposition. Cities which will be included are Philadelphia, Boston, Buffalo, and Baltimore.

In addition, through the cooperation of the Fuel Merchants Association of New Jersey, it is putting on an exhibit for the benefit of retail coal men at that association's convention at Asbury Park, November 12-13.

Requests Catalogs

ELIZABETH, N. J.—Franklin Refrigeration Service has opened offices at 618 Franklin St., this city, and requests engineering data and catalogs from manufacturers of heating, ventilating, and air conditioning equipment.

Numerous A.C. Papers on ASRE Program

NEW YORK—The newest developments in air conditioning and various aspects of thermal problems are to be covered in the technical program at the 32nd annual meeting of the American Society Refrigerating Engineers, which opens December 2 at the Hotel Pennsylvania.

Included in the program are the following: Wednesday morning session—Residence Cooling Investigations, Prof. H. J. Macintire, University of Illinois; A Review of Refrigeration and Air Conditioning Codes and Standards, Chester Lichtenberg, General Electric Co.; Evaporative Cooling Methods and Equipment, W. L. Fleisher, consulting engineer. Wednesday afternoon session—Moisture in Relation to Insulated Walls, Harvey B. Lindsay, president, Dry-Zero Corp.; Condensing Water Economizers, Byron E. James, York Ice Machinery Corp.; Air Conditioning Applied to Lithography, L. C. Weber, Bureau of Standards. Thursday morning session—Psychrometric Data with Reference to Low Temperatures, W. H. Carrier, Carrier Corp. Thursday afternoon session—Thermal Expansion Valve Requirements for Freon, J. C. Bergdoll, product engineer, York Ice Machinery Corp.; Commercial Absorption System, Glenn F. Zellhoefer, Williams Oil-O-Matic Heating Corp. Friday morning session—Silica Gel in Air Conditioning, W. E. Stark, Bryant Heater Co.; Lithium Chloride System, Dr. A. A. Berestneff.

Chicago's Air Conditioning Plants Require 34,000,000 Gallons of Water per Day—Sewer Capacity Insufficient

CHICAGO—Loran D. Gayton, acting city engineer of the City of Chicago, spoke on Air Conditioning—Chicago's Water Problem at the October 12 meeting of the Illinois Chapter of the ASHVE. The meeting, held at the Hotel Sherman, was featured by the presentation of a desk set to James H. Milliken, president last year. The presentation was made by John Howatt.

Mr. Gayton presented an informative paper on the present and probable future demand on Chicago's water supply system; ability of the water supply to meet the demands; ability of the sewers to carry away the waste water, and the possible solution of the problem. In covering these points he considered only the central business district of Chicago.

He stated that in this district, as of September 1, 1936, there were 398 air conditioning installations with a total refrigerating capacity of 11,865 tons. On a basis of 2 gal. of water per minute per ton of refrigeration required for condensing purposes, these present installations would use approximately 34,000,000 gal. of water per day.

The speaker estimated that present air conditioning installations represented 16% of the future potential in this area and that this potential would be reached within twenty years. In that event, 295,000,000 gal. of water per day would be required for air conditioning alone.

Facilities now for supplying water to this area are capable of delivering 160,000,000 gal. per day under normal circumstances and a peak load of 240,000,000 gal. per day if necessary. The water now available, therefore, is sufficient to meet all demands, including air conditioning, for the next ten years, and plans for the future will keep the supply abreast or ahead of all possible requirements.

The sewer capacity in the Loop is not large enough to dispose of the waste water during the summer, the speaker said. He explained the difficulties connected with the rebuilding of the entire sewer system in the Loop area. This would involve a large expenditure, cause inconvenience to traffic, and would have to be approved by property owners. He stressed, therefore, the solution of so designing and installing air conditioning equipment that the amount of water required would be reduced to a minimum.

O. W. Armspach moved that the president appoint a committee of five chapter members to study this water supply and water disposal problem. There must be some solution, he said. His motion was seconded and passed. Mr. Gayton announced that his department was going to carry on a survey of this situation and offered its help to this chapter committee.

President Hayes announced the chairmen of the chapter's 1936-37 committees as follows: Membership, Tom Brown; Meetings and Publications, L. S. Ries; Finance, J. R. Vernon, and Legislative, J. H. O'Brien.

Boston District Heating Group Meets

BOSTON—Members of the Boston section, National District Heating Association, held their 4th annual meeting October 22 at the Engineers Club. D. S. Boyden, toastmaster, introduced a number of guests, including M. D. Engle, the new national president, Glenn Winans, Detroit Edison Co., chairman of the district committee, and H. C. Kimbrough, chairman of the national membership committee, and others. The sessions began at 3 p.m. and continued through the evening, except for dinner. The program included reports of the various committees at the national convention. Indicative of the increasing interest in district heating was the announcement that 17 new members had been admitted to the Boston section.

The following officers were elected: Chairman, Raymond M. Nee; vice-chairman, H. W. Frederick; treasurer, R. H. Kreisinger; secretary, D. E. Washburn; members of the executive committee, J. F. Treat, E. D. Learned, L. K. Spink and Fred Carth.

Farmer and Yarnall Elected

NEW YORK—Election of Frank Malcolm Farmer, vice-president and chief engineer, Electrical Testing Laboratories, this city, as chairman of the Engineering Foundation, research organization of the national engineering societies, was announced recently. D. Robert Yarnall, Yarnall-Waring Co., Philadelphia, was elected vice-chairman of the organization. Mr. Yarnall was also chosen chairman of the Foundation's research committee.

$25 Million in Stoker Sales

LAKE PLACID, N. Y.—Retail stoker sales will top the $25 million mark this year, it was estimated by C. T. Burg, general sales manager, Iron Fireman Manufacturing Co., in an address before the New York State Retail Solid Fuel Merchants Association convention in September.

Declaring the stoker industry has definitely grown up, Mr. Burg noted a favorable trend among heating contractors throughout the country to automatic coal burners.

Refrigeration Course at U. of Cincinnati

CINCINNATI—Recent developments in the refrigeration field will be studied in a new University of Cincinnati evening course announced recently. C. A. Joerger, professor of mechanical engineering, will be in charge. The course is planned for salesmen, service men, and employes of refrigeration manufacturers and dealers. Covering both domestic and industrial refrigeration systems, Professor Joerger will lecture on refrigerants, insulation, instruments, operation, control and safety devices. Professor Joerger's class will meet each Wednesday from 8:30 to 10:05 p.m. for 12 weeks.

Form Oil Heating Association

TORONTO, ONT.—The Oil Heating Association was recently formed among representatives of oil companies and manufacturers of oil heating equipment, for the purpose of promoting the sale of oil burners and accessories. A. S. Morgan, Fess Oil Burners of Canada, Ltd., this city, is chairman.

Kelvinator, Nash May Merge

CHICAGO—Nash Motors Co. and Kelvinator Corp. will merge into a new concern to be known as the Nash-Kelvinator Corp. if shareholders agree to a proposal approved late in October by directors of the two companies. The consolidation is said to be one of the most important since the wave of mergers subsided with the advent of the depression.

The Nash company is one of the pioneer automobile manufacturing companies and was founded in 1916 as a successor to the old Jeffery Co. Kelvinator is the successor to the Electro-Automatic Refrigerating Co., said to have made the first successful mechanical refrigerators in 1914.

Under the proposed arrangement the present owners of Nash stock will have a 62½% interest in the corporation, the balance going to present owners of Kelvinator.

If this proposal is approved it will mark the entrance of the third large automobile company into the heating and air conditioning business, General Motors, through its Delco-Frigidaire division, and Chrysler previously having entered this field. Some months ago Ford was reported to have such a move under consideration.

Well Water Lake to Cover Store Roof

CHICAGO—An unusual application of well water for cooling was recently announced for the million dollar branch store of the Wieboldt Co., to be constructed soon. Water from a 2000-ft. artesian well will be pumped to the roof of the three-story structure to form a circulating lake several inches deep.

According to F. A. Byrne, mechanical engineer of Holabird and Root, the architects of the store, with well water at temperatures ranging from 56F to 60F, this layer of water will insulate the building from the direct rays of the sun, reducing interior ceiling temperatures 15 to 30F. At the same time it is expected to reduce the required capacity of the store's air conditioning compressor plant by approximately eight tons.

The building will be constructed of Indiana limestone and great longitudinal bands of glass brick will take the place of conventional windows in the store.

Welch Talks in N. J.

ORANGE, N. J.—J. C. Welch, Fox Furnace Co., who helped draft the ordinance on air conditioning for Montclair, N. J., addressed the Air Conditioners' Association of New Jersey on October 6 in the Public Service Building here. He spoke on the factors necessary for an efficient air conditioning system.

Gas Power Lines Predicted at AGA Convention

ATLANTIC CITY—The time will come when gas pipes from coal mines to metropolitan areas will take the place of the high-tension electric power lines, according to E. P. Kramer an executive of the Atlantic Gas Light Co., in addressing the 18th annual convention of the American Gas Association here October 26-30. He said that coal converted into gas at the mines would be piped to the metropolitan centers and there converted into heat and power. The smoke thus will be left back in the hills.

"Out of California," Mr. Kramer said, "there is a 183-mile electric transmission line. Under it runs a 22-in. gas pipe line. The gas line delivers seventy-five times as many heat units at the other end as does the 220,000-volt wire system and it costs only $65 for each 1,000,000 hp-hr. transmitted, compared with $190 for the electric line.

"Gas can be made in the summer and stored under high pressure in underground tanks for use when needed, and you can't do that with electricity. As for the supply, the AGA estimates the national coal reserve as enough for 4,500 years."

Other speakers said the nation was on the threshold of a building boom, predicted increased construction of integrated houses and announced a 100% increase in the sale of gas appliances during the first eight months of this year. The association adopted a resolution calling on member companies to use local newspaper advertising to tie in with the industry's national campaign.

R. S. Agee of Washington told the convention that the United States needs 6,700,000 new homes, and he predicted that this country was on the verge of a building boom.

Natkin Expands

WICHITA, KAN.—R. R. Douglas, sales manager of Natkin & Co., announces that the firm will now handle oil burner furnaces and gravity oil burners. This firm covers both Kansas and Oklahoma.

The local branch office of Moser & Suor, Inc., reports the recent appointment of Paul Bell to the general managership of the commercial department. This firm handles Norge air conditioning equipment.

J. W. Jenner, who recently purchased the Shelley Electric Co., 123 S. Main St., has completely remodelled the display room and reports that the new company will engage in the distribution and installation of air conditioning equipment. G. R. Crossen, formerly of Kansas City, will be in charge of the engineering department.

Illinois Engineering Acquires Old Concern

CHICAGO—Central Heat Appliances, a company well known in the central station steam industry for many years and owned and operated by J. C. Hornung, who developed the patents controlled by the company, has been acquired by Illinois Engineering Co. The latter concern has handled the manufacturing for Central Heat Appliances for 20 years.

Mr. Hornung has been prominent in district heating for over 36 years and has, during that time, developed a number of temperature and distribution appliances for both steam and forced circulation hot water heating known as the Hornung differential system. He will devote some of his time in the future to research work and further development of control appliances.

Livingston Elected by Omaha Bureau

OMAHA—Milton Livingston, secretary of the Frigidaire distributor in this city, has been elected president of the Air Conditioning Bureau of Omaha. The bureau has its heaquarters at 720 Electric Building, and acts as a neutral cooperative representative of the utilities, dealers, and others interested in air conditioning in this territory. John S. Davidson is secretary of the bureau and W. R. White is engineer. Mr. Davidson publishes a monthly paper entitled, *The Business Conditioner* which is the official publication of the bureau. The bureau has 15 members.

Up to October 10, 83 summer air conditioning installations were made in this city since January 1. These total 1415⅝ hp. according to Mr. Davidson.

A. C. for Office Building

CINCINNATI—Work has started here on the second office building to be air conditioned, the structure being the 13-story Gwynne Building, northeast corner of 6th and Main Sts. Including the cost of an air conditioning unit installed last fall, the total cost of the equipment will be $200,000.

The decision to air condition the entire 105,000 sq. ft. was made because of the experience of the Procter and Gamble Co., soap manufacturer and owners of the building, through a winter and summer season with air conditioning in its own executive offices, which occupy five floors in the building.

The American Building farther uptown at Central Parkway and Walnut St. was air conditioned about two years ago and was the first office building here to be so equipped.

Anthracite Group Announces Plans

NEW YORK — Seventeen territories have been set up in which a field representative will function for Anthracite Industries, Inc. The 17 field representatives will contact retailers, heating contractors, equipment men, and consumers. An advertising campaign designed to function in connection with the retailers' local advertising will shortly be released by this organization, which has selected as a slogan the phrase "The Solid Fuel for Solid Comfort." This slogan the retailer will be urged to use in his newspaper, mail, and other advertising.

The territories in which Anthracite Industries has set up local representatives, together with the names of the representatives follow: Brooklyn and Long Island, Daniel Zupa; New York, Jean Fitz; Albany, Robert C. Girke; Syracuse, E. G. Freidell; Rochester, Norman C. Curtin; Buffalo, (to be chosen); Philadelphia, J. Earle Myers; Allentown, J. Muir Crosby; northern New Jersey, Charles T. Heslin; southern New Jersey, Ralph L. Scott; Boston, Myron R. Grover; Springfield, Harold S. Maxson.

Anthracite Industries, Inc., was formed some months ago to promote the use of hard coal. Present subscribers to it, said to represent more than 80% of the total industries, are: Alden Coal Co., Bell Colliery Co., Buck Mountain Coal Mining Co., Centralia Colliery Co., John Conlon Coal Co., Coxe Brothers, Dial Rock Coal Co., East Bear Ridge Colliery Co., Glen Alden Coal Co., Green Ridge Coal Co., Haddock Mining Co., Heidelberg Coal Co., Hudson Coal Co., Jeddo-Highland Coal Co., Lehigh Navigation Coal Co., Madeira, Hill & Co., Moffat Coal Co., Penn Anthracite Collieries Co., Phila. & Reading Coal & Iron Co., Pompey Coal Co., Pine Hill Coal Co., Price-Pancoast Coal Co., Scranton Coal Co., St. Clair Coal Co., Sterrick Creek Coal Co., Stevens Coal Co., Suffolk Coal Co., Sullivan Trail Coal Co., West End Coal Co., Weston Dodson Coal Co., and Wyoming Valley Collieries Co.

Regional Burner Meeting in Chicago

CHICAGO—The first OBI regional meeting in this area was held October 2. Approximately 140 executives of the burner, oil, and service industries in the Chicago market attended.

Regional Director Charles Lockwood of Nu-Way Corp., organized the meeting which was jointly sponsored by the Burning Oil Distributors Association, the Chicago Oil Burner Association, and the Chicago Oil Heat Committee. Frank E. Spencer of the latter organization acted as chairman.

Oil Burner Institute's managing director, G. Harvey Porter, came to Chicago for the meeting and put forth the aims and policies of the Institute from a national viewpoint. He was followed by Mr. Spencer who talked of what the regional plan, particularly in the Chicago market, hoped to accomplish. Other speakers were J. W. Manny, president, Chicago Oil Burner Association, who traced the growth of the oil burner industry, D. S. Whamond, president, Arrow Oil Burner Corp., who handled the question of free burner service by reviewing the efforts and results of local committees concerned with this problem over the past few years, and W. A. Matheson, Chicago branch manager, Williams Oil-O-Matic, whose topic was "How Oil Burners Are Sold."

The meeting was adjourned amid expressions of satisfaction that its primary purpose — finding a cooperative and mutual basis on which local problems could be worked out—had been accomplished.

Furnace Men Schedule Winter Meeting

COLUMBUS, OHIO—Discussion of the Robinson-Patman Act, papers on summer cooling in connection with warm air furnaces, and other reports from the association's research work in the University of Illinois, will be included in the program of the December convention of the National Warm Air Heating and Air Conditioning Association to be held in Chicago, December 15-17. Headquarters will be at the Stevens Hotel.

According to an announcement by A. W. Williams, managing director of the association, a special noon day lunch on Wednesday with a surprise entertainment will be held in place of the usual evening banquet.

Expect Largest Power Show Since '29

NEW YORK—The 12th National Exposition of Power and Mechanical Engineering will be held at Grand Central Palace, New York, during the week of November 30 to December 5. This years's event is expected to be the most successful since 1929. Three floors of Grand Central Palace will be occupied and admission will be by invitation or by registration only. Operating exhibits will be featured and the equipment on display will range from power producing equipment, factory machinery and industrial equipment to materials of construction and plant accessories.

Automatic stoker equipment will feature operating exhibits comparing a new conical distributor with the typical flat type chute. The exhibit is designed to show the difference in fuel bed with the use of segregated and non-segregated feed.

Steam accessories will include an exhibit of seamless copper and welded stainless steel floats; also a line of metal floats for all purposes, of interest to manufacturers of steam traps, oil field equipment, pumps, and heating specialties. Steam traps constructed of semi-steel and forged steel, and representing open and inverted bucket types, will be on exhibition, likewise, strainers, reducing valves, globe and blow-off valves. One exhibitor of steam traps will show what is claimed to be the only inverted bucket trap built with a variable air venting device (non-thermostatic) to prevent dribbling caused by balancing.

Lecture Course on Welding

NEW YORK—The local section of the American Welding Society has arranged with Brooklyn Polytechnic Institute to present this winter a series of lectures on the fundamentals of welding. The lectures will be given in the Institute, 99 Livingston St., Brooklyn, on Tuesday evenings at 6:45, beginning November 10.

The first lecture will be open to anyone interested in welding and the entire series will be free to members of the American Welding Society. Information on enrollment fee for non-members of the Society and other particulars may be obtained from the American Welding Society, 33 West 39th St., New York.

Arnold Addresses Joint Meeting in Boston

BOSTON — Members of the National Producers' Council, Boston Chapter, the Air Conditioning Bureau, and Boston Oil Burner Associates, together with builders, architects, and contractors, held a joint dinner and meeting October 14 at the Chamber of Commerce. The meeting was sponsored by the Oil Burner Associates, with Secretary Fred N. Beckwith as master of ceremonies. Guest speakers were Glenn Arnold, vice-president, Petroleum Heat & Power; John W. Scott, Buckley & Scott Utilities, Inc.; Don J. Edwards, General Heat & Appliance; Clyde W. Colby, consulting engineer, air conditioning division, General Electric Co. Several hundred were present.

Climafy New Synonym for A.C.

NEW YORK—A. N. Williams, the winner of the contest held recently by *Forbes Magazine* to find a good synonym for the words "air conditioning" coined the verb "climafy." Uses of the word are given in the following sentences: "Have you climafied your house?" "Are you going to climafy your factory?" "Do you sleep better in climafied railroad cars?"

NEW EQUIPMENT

Nu-Way Genii Hot Water Generator

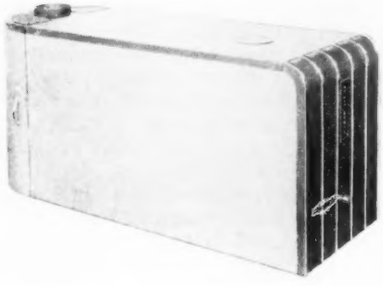
NAME AND MODEL NUMBER—Nu-Way Genii hot water generator, types W and WL.

PURPOSE—For supplying hot water to hotels, apartments, restaurants, and residences.

FEATURES—Model WL has a storage capacity of 91.6 gal. while model W has a capacity of 43 gal. The units will burn either No. 3, No. 2, No. 1 or 27 plus diesel oil. Oil feed, either gravity or suction. Electric ignition on both models.

SIZES AND CAPACITIES—Model WL, 33 sq. ft. heating surface, 170 gal. recovery capacity per hour, 100F rise, 212 gal. per hr., 80F rise. Model W, 18 sq. ft. heating surface, recovery capacity per hour 75 gal. for an 80F rise.

MADE BY—*The Nu-Way Corp., Rock Island, Ill.*



Supreme-Friez Humidity Control

NAME—Supreme-Friez humidity control.

PURPOSE—A simplified humidity control, consisting of a Supreme solenoid water valve mounted on a Friez insertion humidistat.

FEATURES—Device is made up of a Friez insertion humidistat which uses a human hair element to indicate changes in relative humidity. The solenoid water valve is built up with a cast iron case and has a terminal chamber for conduit and BX connections. The valve is especially designed for humidity application.

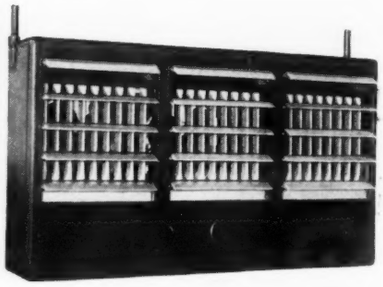
MANUFACTURED AND ASSEMBLED BY—*Supreme Electric Products Corp., 99 Mt. Hope Ave., Rochester, N. Y.*

Bryant Gas-Fired Unit Heaters

NAME AND MODEL NUMBER—Bryant gas-fired unit heaters, models 85 and 85-C.

PURPOSE—Unit heaters utilizing gas as a fuel.

FEATURES—Built-in draft diverter and rear flue outlet. All controls on this equipment with the single exception of the combination snap valve and gas pressure regulator at the rear of the unit, are self-contained within the heater cabinet. All primary equipment such as gas burners, fans, controls, etc., are easily accessible for servicing through removable grilles at the back of the unit. The control equipment has a master regulator and combination snap valve and gas pressure regulator all controlled by a sail valve acting as a check on burner operations and preventing the burning of gas except during periods of fan operation. Model 85 units are furnished with heavy sheet steel combustion chambers and flue collectors and steel heat exchanger tubes, while 85-C units are furnished with cast iron combustion chambers and flue collectors and chromium steel alloy



heat exchanger tubes. Type AG or garage type units available for installation in hazardous atmospheres. Unit illustrated is model 3A-85.

SIZES AND CAPACITIES—Three standard sizes, 85,000, 170,000 and 255,000 B.t.u. input per hour.

MADE BY—*The Bryant Heater Co., 17825 St. Clair Ave., Cleveland, Ohio.*

National Art Radiator

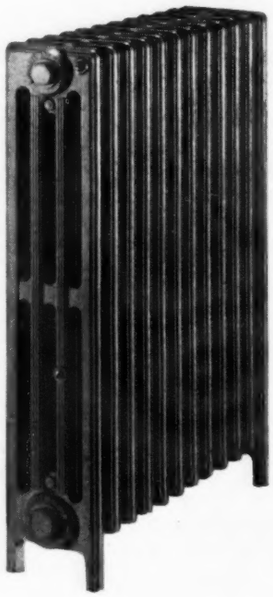
NAME—National Art radiator.

PURPOSE—A small tube type radiator for steam or hot water.

FEATURES—This radiator, according to the manufacturer, represents an entirely new style of radiator surface. The designer has utilized vertical lines and set-back planes in such a manner as to make it harmonize with the vertical lines of window mullions and drape folds. The manufacturer also claims that the units occupy less floor space while giving as much heat as the older type radiators. Radiators are of cast iron construction and are assembled in any length in multiples of 1¼ in. Radiators are of push nipple construction and can be furnished without legs.

SIZES—Units are made in three widths; 3, 4, and 5-tube and in heights ranging from 19 to 26 in.

MADE BY—*National Radiator Corp., 221 Central Ave., Johnstown, Pa.*



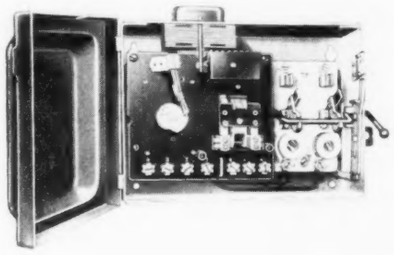
Penn Stoker Control

NAME AND MODEL NUMBER—Penn stoker control, types 552 and 554.

PURPOSE—To control the operation of coal stokers.

FEATURES—A bimetal overload protection unit, built-in knife switch and fuse receptacle, synchronous electric timer for maintaining proper combustion, pilot relay and transformer for supplying low voltage current to the thermostat circuit. Manufacturer states that the bimetal overload unit gives positive motor protection against overload from any cause. All stoker controls are rated not to exceed ½ hp., 110 volts, 50 or 60 cycle as standard and are available for ½-hp., 220-volts service, and for odd cycle service in either 110 or 220 volts when specified.

MADE BY—*The Penn Electric Switch Co., Des Moines, Ia.*



Aminco Anemometer

NAME—Aminco TardiGrade Anemometer.

PURPOSE—For measuring velocity of air current as low as 6 f.p.m.

FEATURES—Consists of an anemometer element which is placed in the duct or at the position where the velocity of air is to be measured and of an indicating instrument which can be located in any convenient spot. Indicating instrument can be used with a number of elements so as to show the velocity at a number of different points. It is said that a measurement can be made in a few seconds and that inexperienced persons can be taught to use the device in a few minutes. The manufacturer states that the instrument can be used at any temperatures between the lowest refrigeration temperature and 300F, and that the maximum error when operating at either extreme is less than 2% of the calibration readings.

PRICE—Complete instrument, $190; extra anemometer elements $40, f.o.b.

MADE BY—*American Instrument Co., Inc., 8010-20 Georgia Ave., Silver Spring, Md.*

Electric Air Heaters

NAME—Electromode heaters.

PURPOSE—For heating, using electricity as an energy source.

FEATURES—Element used is of cast aluminum construction. Heating is done by means of a calrod around which the aluminum grid is poured. Shrinking of the metal in cooling causes the calrod to become an integral part of the heating element and is said to eliminate all hot wires and dead air spaces. Each unit is thermostatically controlled. The unit is of the built-in type with only the grille work exposed in the room.

MADE BY—*The Electric Air Heater Co., Div. American Foundry Equipment Co., 555 Byrkit St., Mishawaka, Ind.*

G-E Squirrel Cage Motors

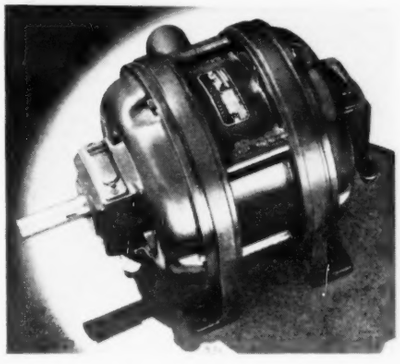
NAME — G-E squirrel-cage polyphase induction motors.

PURPOSE—For applications requiring open, sleeve or ball bearing, enclosed, enclosed fan-cooled, splashproof and vertical motors.

FEATURES—Stator coiled windings which are insulated with a material which has a higher resistance to moisture and other influences such as mild acids, alkalis, oil, and abrasion. A new frame provides increased resistance to vibration and shock. Convenience features include: two-part conduit boxes which can be mounted in any one of four positions; knock-off legs on end shields, adequate wrench room for removing end-shield cap screws; ball bearings provided with pressure grease fitting and relief plug; sleeve bearings equipped with oil-filler gage that can be placed on either side of housing.

SIZE—From 1 to 15 hp. at 1,800 r.p.m.

MADE BY—*General Electric Co., Schenectady, N. Y.*



Bausch & Lomb Dust Counter

NAME—Bausch & Lomb dust counter.

PURPOSE—An instrument for measuring the dust concentration in air.

FEATURES—Dust counter combines in one unit both the air sampling device and a dark field microscope viewing and counting system. The air sampling mechanism consists of a moistening chamber through which the air is drawn by means of a calibrated hand pump of 1/1,000 cu. ft. capacity and an impinging device which deposits the dust particles suspended in the air on a circular glass plate within the instrument. Twelve samples may be collected on one slide and these samples may be viewed and counted without removal. They may be preserved by sealing a cover glass to the slide. The viewing and counting apparatus consists of a built-in compound microscope of 200X magnification. The apparatus is so calibrated that by multiplying the number of particles appearing in a square field by 100,000 the dust total count per cubic foot is secured.

MADE BY—*Bausch & Lomb Optical Co., Rochester, N. Y.*

Hays Orsatomat

NAME—Hays Orsatomat.

PURPOSE—An automatic instrument for analyzing flue gases.

FEATURES—This instrument is an automatic orsat device which can analyze a sample of flue gas within twenty seconds by simply turning a lever. The results are given by a pointer on a scale. The entire action is said to be automatic. The Orsatomat consists of a rotatable analyzing body which contains the measuring and absorption chambers and

is charged with mercury and an absorbing chemical; a metallic bellows and linkage for moving the pointer; an aspirator bulb and the necessary rubber tubing, and a pressed steel case of special non-tipping design fitted with a carrying handle. On the model illustrated, a pointer draft gage is included and space is provided for a flue gas thermometer.

TYPES AVAILABLE — Standard model for analyzing CO_2, twin unit model for analyzing both CO_2 and O_2. Models with special scales for testing automobile exhaust gases.

MADE BY—*The Hays Corporation, Michigan City, Ind.*

Ilg Floated Drive Bracket

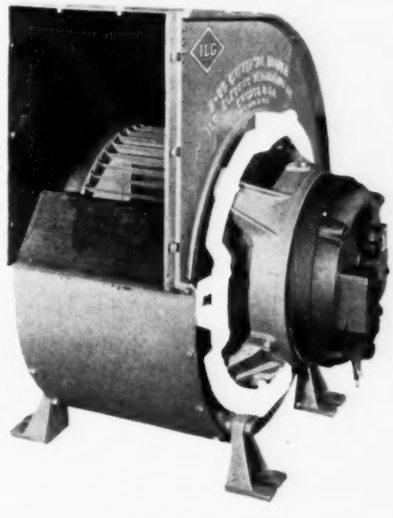
NAME—Ilg floated drive bracket.

PURPOSE—A sound and vibration dampening device for a direct-connected blower. The new mechanism is intended for use on Ilg direct-connected blowers in locations where special precautions must be taken to obtain unusual quietness of operation.

FEATURES—The standard Ilg motor bracket is mounted on a second floating bracket which is insulated from the blower housing to which it is secured by flexible rubber cushions.

AVAILABLE ON—Can be obtained as original equipment on any Ilg type B or type BC direct-connected Universal blower. Also can be used on blowers already installed.

MADE BY — *Ilg Electric Ventilating Co., 2850 N. Crawford Ave., Chicago.*



Attachments for Alnor Velometer

MODEL NUMBERS—Nos. 2400 and 2485.

PURPOSE—Attachments to increase the usefulness of the Alnor Boyle system velometer. Type 2400 is used to obtain direct readings of static pressure in ducts, plenum chambers, and pipes in inches of water. Type 2485 is used for obtaining direct readings of total pressure in inches of water.

FEATURES—Type 2400 can be used for either positive static readings with a jet, tube, and fittings attached to the left side of the velometer or for suction or negative readings with the jet, tube, and fittings attached to the right side of the instrument. Type 2485 is for insertion in an air duct or chamber with the opening of the jet pointed directly into the air stream. A small guide fin on the jet at the tube end aids in assuring that the opening of the end is in line with the air stream and facing into the air stream. Inch markings on

the jet are provided to enable the user to place the jet at the desired distance within the duct.

MADE BY — *Illinois Testing Laboratories, 420 N. LaSalle St., Chicago.*

Alfol Radiator Reflectors

NAME—Alfol heat reflectors.

PURPOSE—To reflect the heat from a radiator back into a room.

METHOD OF OPERATION—Reflector is made of a sheet of aluminum which, it is said, reflects 95% of radiant heat. Sheet of aluminum is cemented to a piece of light sheet metal and is held securely in the back of the radiator by a set of special fastenings. Manufacturer says that when the reflector is installed in this manner 95% of the radiant heat of the radiator is reflected back and the temperature of the air around the radiator is raised from 12 to 20F

MADE BY—*Alfol Insulation Co., Inc., Chrysler Bldg., New York.*

Chadel Dryer

NAME—Chadel dryer.

PURPOSE—A domestic laundry dryer which operates on low-pressure steam.

FEATURES—This dryer is designed to operate with low-pressure steam generated on the premises. It utilizes extended surface copper tube heat transfer coils and a small pressure disc fan. Manufacturer states that with steam at 2-lb. pressure, a three-pass coil dryer will give a final air temperature of 210F. This air temperature is said to maintain 190F in the body of the dryer. Air taken into the dryer is filtered by means of a glass filter.

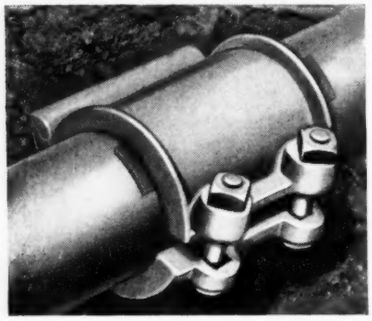
SIZES — Height, 61 in., width 58 in., and depth 21 in. Weight 310 lb.

MADE BY—*Chadel Drying Co., 347 Madison Ave., New York.*

Skinner Pipe Clamps

NAME—Skinner pipe clamp.

PURPOSE—A pipe clamp for stopping leaks in pipes.



FEATURES—All clamps except those for use on high pressure lines, can be installed while lines are in service. Clamps are hinged on one side for ease in installation. They are enamelled and equipped with cadmium-plated steel bolts and rubber gaskets.

SIZES—Available for stopping leaks in all types of pipe lines, either high or low pressure.

MADE BY—*M. B. Skinner Co., 3774 W. Sample St., South Bend, Ind.*

Hill Air Conditioner

NAME AND MODEL NUMBER—Hill Air Conditioner and Heat Saver.

PURPOSE—To supply warmed and humidified air, utilizing the heat in the flue gas from the boiler.

METHOD OF OPERATION—The unit is much like a tube pipe boiler with the hot flue gases passing through the tubes. It is installed between the boiler and the chimney. The lower tubes in the heat saver are covered with water while the upper tubes have air passing over them. The air enters the heat saver just over the surface of the water and carries the moisture to the rooms together with the hot air. A float valve connected to the water supply system maintains the water level in the heat saver.

MADE BY—*Frank M. Hill Machine Co., 50 School St., Walpole, Mass.*

Fluid Heat Burners

NAME AND MODEL NUMBER—Fluid Heat pressure type oil burners, models P-6A, P-9A, and P-12A.

FEATURES—Burners have an air regulation device on the discharge side of the fan. This principle has been used on previous models for the last two years. The P-6A model has intermittent ignition and the P-9A and P-12A have constant ignition.

CAPACITIES—Maximum nozzle capacities 6, 9, and 12 gal. per hr., respectively.

MADE BY—*Fluid Heat Div., Anchor Post Fence Co., Eastern Ave. & Kane St., Baltimore, Md.*

Poggel Catchdew Dehumidifier

NAME—Poggel Catchdew dehumidifier.

PURPOSE—For removing excess moisture from room air.

METHOD OF OPERATION—These units are designed for use in rooms such as printing press rooms where it is desired to lower the relative humidity. The manufacturer claims that excess moisture is absorbed from the air by electro-chemical action. The units are designed to be suspended from the ceiling and operated on either a.c. or d.c. current, 110 volts. Manufacturer states that each unit is capable of taking care of 800 sq. ft. of floor area.

MADE BY—*Advance Manufacturing Co., Inc., Louisville, Ky.*

Eagle Plastic Insulation

NAME AND MODEL NUMBER—The Eagle Super 66 plastic insulation.

PURPOSE—A plastic insulation for use on practically any form of heat producing or transferring equipment with surface temperatures as high as 1,800F.

FEATURES—Insulation can be applied on either hot or cold surfaces and the manufacturer states that its strong adhesiveness makes it especially useful for insulated irregular

pieces. It is installed by mixing the material with water, spotting it on the surface, and then trowelling it to a smooth finish. It can be removed, remixed, and used over again when subjected to temperatures up to 1,200F.

COVERAGE—60 sq. ft., 1 in. thick per 100 lb.

MADE BY—*The Eagle-Picher Sales Co., Temple Bar Bldg., Cincinnati, Ohio.*

Westinghouse Midget Switch

NAME AND MODEL NUMBER—General purpose type D safety switch.

PURPOSE—For use on oil burners and other applications where midget switches are desired.

FEATURES—The switches are extremely small in size, and are said to be sturdy in construction and pleasing in appearance. It is claimed that front operation and compact design make their use possible in many places where side operating switches cannot be used. The cover may be sealed and provisions made for locking switch in off position.

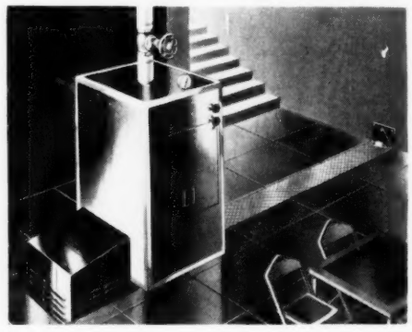
TYPES AVAILABLE—Two pole NEC and plug fuse types, also two and three pole solid neutral.

MADE BY—*Westinghouse Electric and Mfg. Co., East Pittsburgh, Pa.*

Anchor Bin Feed Kolstoker

NAME—Anchor bin feed Kolstoker.

PURPOSE—A stoker which automatically feeds the coal from the bin to the burner.



FEATURES—Stoker is furnished in either draw conveyor or drive conveyor type. In the draw conveyor type the screw draws the coal from the bin and conveys it under the floor through a feed tube to the burner. A reverse screw arrests the movement of the coal toward the stoker power unit and forces it up through the burner to the fire. In the drive conveyor type, the power unit of the stoker drives or pushes the coal from the bin to the boiler instead of drawing it as in the draw conveyor type. In this case, the stoker power unit is located behind the bin. The illustration shows a bin feed draw conveyor type.

MADE BY—*Anchor Stove and Range Co., New Albany, Ind.*

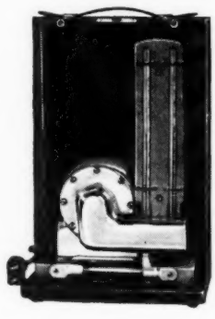
H-B Aspirating Psychrometer

NAME—H-B aspirating psychrometer.

PURPOSE—To indicate the amount of humidity in the air.

FEATURES—The manufacturer states that accurate readings can be obtained in one minute. Psychrometer can be obtained in either of two portable types; one a self-contained battery type, and the other a plug-in type operating on 110 volts, a.c. Both models employ the aspirating principle of drawing air at the proper velocity by a motor-driven fan across the sensitive mercury bulbs of two thermometers which are suspended in the air stream. The thermometers are calibrated in single degrees and are placed near the end of the intake sleeve, the incoming air passing first over the dry bulb and then over the wet bulb. A table for computing relative humidity and pocket slide rule for determining direct reading relative humidity are furnished with each instrument.

MADE BY—*H-B Instrument Co., 2518 N. Broad St., Philadelphia, Pa.*



Westinghouse Fan Cooled Motors

NAME—Type SK explosion-tested, fan-cooled, direct d.c. motors.

PURPOSE—For use in locations where explosive gases or dust may exist.

FEATURES—These motors are designed to withstand an internal explosion of gas or coal dust without injury to the equipment and without emitting flames or sparks which would ignite surrounding gas. A fan on the commutator end forces a large volume of cooling air through air passages in the motor.

SIZES AND CAPACITIES—5 to 75 hp. with 115, 230, and 550 volts.

MADE BY—*Westinghouse Electric and Mfg. Co., East Pittsburgh, Pa.*

Davies Airplex Filters

NAME—Davies Airplex dry air filters.

PURPOSE—Cleaning air.

FEATURES—Filter medium of the Airplex is a specially processed cotton, lightly glazed on both sides to prevent disintegration. Each unit contains about 30 sq. ft. of this filter medium. Large surface is obtained by folding the material into 4-in. pleats forty-two times inside the cartridge or box. It is said that the filtering material is not affected by humidity. Filters are serviced by replacing the complete cartridge after it accumulates its maximum load of dust which, under average operating conditions, occurs every two to three months. For special applications, manufacturer can supply a filter medium which is chemically treated so that it is fire retarding and will only char in contact with a flame.

SIZES AND CAPACITIES—Normal rating is 800 c.f.m. per unit with an initial resistance of 0.18 in. of water. The standard size is 20 x 20 x 4 in. 22 x 20 x 2 in. and 16 x 25 x 2 in. sizes are also available.

MADE BY—*Davies Air Filter Corp., 300 Fourth Ave., New York.*

Timken Pressure Burner

NAME AND MODEL NUMBER—Timken Silent Automatic pressure burner, model GH.

FEATURES—Burner consists of a 1/6-hp. split-phase motor, directly connected to the blower and oil pumps by means of a flexible coupling. Oil pump is equipped with dual strainers and the transformer has an interference eliminator. A propeller-like, four-bladed turbulator located in the air tube just back of the oil nozzle is said to increase the combustion efficiency. Burner is finished in black or green.

SIZES AND CAPACITIES—5½ to 10 g.p.h. and approximately 3,600 sq. ft. of e.d.r.

MADE BY—*Timken Silent Automatic Div., Timken-Detroit Axle Co., 100 Clark Ave., Detroit, Mich.*

Gar Wood Air-Duct System

NAME—Gar Wood air-duct system.

PURPOSE—A predesigned air-duct system for automatic heating and air conditioning.

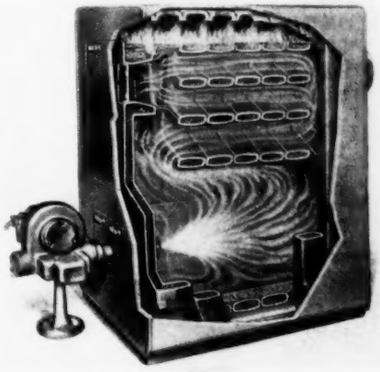
FEATURES—The duct system is composed of predesigned stock parts. Runouts from the trunk lines to the grilles are limited to four sizes, all a single depth to fit a standard of 2 in. x 4 in. partitions. Sizes are maintained for the entire run without transformation. It is said that because of a newly developed method of trunk design, the number of stock parts required has been reduced to one standard sized panel for each depth and if a single depth trunk is used there is only one part employed.

MADE BY—*Gar Wood Industries, Inc., Detroit, Mich.*

Pierce Oil-Burning Boiler

NAME AND MODEL NUMBER—Pierce Oil No. 2.

PURPOSE—For supplying steam or hot water to systems having no more than 3,000 sq. ft. of steam radiator surface, utilizing oil as a fuel.



FEATURES—Boiler is specifically designed for oil burning and has a 5-way heat travel together with a firing chamber, which is completely surrounded by water.

SIZES—For systems having up to 3,000 sq. ft. of steam radiator surface.

MADE BY—*Pierce Butler Radiator Corp., Syracuse, N. Y.*

Whitney Clip Punch

NAME—Whitney Clip punch.

PURPOSE—A tool for joining sheet metal in the construction of ducts.

METHOD OF OPERATION—The tool punches out a triangular "ear" in the seam, this ear then being folded back by hand to form a secure fastening with a three-way lock.

FEATURES—The punch has a capacity of two thicknesses of 16-gage metal and is so constructed that it can be used in narrow places. The jaws and handles are of drop forged steel with hardened pins.

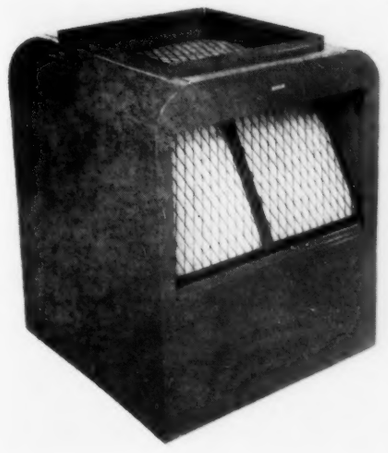
MADE BY—*The Whitney Metal Tool Co., Rockford, Ill.*

Schwitzer-Cummins Blower Unit

NAME—Hy-Duty blower-filter unit.

PURPOSE—For use with a warm air furnace for supplying forced and filtered air.

FEATURES—The blower is a 14-in. Hy-Duty type mounted on self-oiling and self-aligning bearings. Unit is made of heavy gage rust-resisting steel; has ¼-hp. drive motor, and is equipped with an overload production. Unit is guaranteed for two years.



MADE BY—*Schwitzer-Cummins Co., Massachusetts Ave. and Fan St., Indianapolis, Ind.*

Guardian Gas Furnace

NAME AND MODEL NUMBER—Guardian floor furnace, Nos. F-35 and F-70.

PURPOSE—To supply heat to buildings not having basements, utilizing gas as a fuel.

FEATURES—This is a gas-fired, warm-air furnace which is designed to heat residences, lodges, hotels, or stores which do not have basements. The furnace has a one-piece combustion chamber which is sealed at all joints to prevent the flue gases from reaching any part of the living quarters.

CAPACITIES—35,000 and 70,000 B.t.u. per hr., respectively.

MADE BY—*Guardian Appliances, Inc., East 17 & St. Clair Ave., Cleveland, Ohio.*

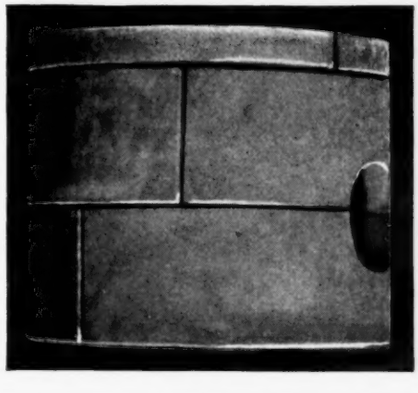
Roto Combustion Chamber

NAME—Roto combustion chamber.

PURPOSE—A combustion chamber for gun type oil burners.

FEATURES—Combustion chamber is made up of refractory insulating materials and comes ready to install with no cementing necessary. Manufacturer claims that it fits all type gun burners and can easily be installed in any furnace or boiler. It is said that the surface temperature of the combustion chamber reaches a high degree soon after the burner starts and thus results in a maximum efficiency.

MADE BY—*The Rex Clay Products Co., 14400 Dexter Blvd., Detroit, Mich.*



Final Degree-Day Figures for September, 1936

With this issue HEATING & VENTILATING begins its ninth year of publishing degree-day data for various large cities. The figures on this page are the final ones for September, 1936, while the preliminary figures for October, 1936, appear on page 74

	Albany, N. Y.	Atlanta, Ga.	Baltimore, Md.	Birmingham, Ala.	Boston, Mass.	Buffalo, N. Y.	Burlington, Vt.
Degree-days for September, 1936	110	0	28	0	122	122	217
Degree-days for September, 1935	167	3	36	0	126	176	261
Degree-days for September, Normal	72	0	0	0	48	75	144

	Cheyenne, Wyo.	Chicago, Ill.	Cincinnati, Ohio	Cleveland, Ohio	Columbus, Ohio	Denver, Colo.	Des Moines, Iowa
Degree-days for September, 1936	216	63	49	77	53	148	62
Degree-days for September, 1935	227	94	59	94	59	144	87
Degree-days for September, Normal	240	3	0	27	0	72	0

	Detroit, Mich.	Dodge City, Kan.	Duluth, Minn.	El Paso, Tex.	Erie, Pa.	Evansville, Ind.	Fort Wayne, Ind.
Degree-days for September, 1936	105	93	221	36	86	18	83
Degree-days for September, 1935	144	69	366	16	120	25	102
Degree-days for September, Normal	42	0	261	0	36	0	0

	Grand Rapids, Mich.	Harrisburg, Pa.	Hartford, Conn.	Indianapolis, Ind.	Kansas City, Mo.	La Crosse, Wis.	Lincoln, Neb.
Degree-days for September, 1936	111	52	100	61	51	105	66
Degree-days for September, 1935	140	79	127	61	47	145	76
Degree-days for September, Normal	57	0	48	0	0	96	0

	Little Rock, Ark.	Los Angeles, Calif.	Louisville, Ky.	Madison, Wis.	Memphis, Tenn.	Milwaukee, Wis.	Minneapolis, Minn.
Degree-days for September, 1936	3	0	25	111	1	89	92
Degree-days for September, 1935	13	0	33	133	17	107	153
Degree-days for September, Normal	0	0	0	87	0	84	93

	Nashville, Tenn.	New Haven, Conn.	New Orleans, La.	New York, N. Y.	Norfolk, Va.	Oklahoma City, Okla.	Omaha, Neb.
Degree-days for September, 1936	1	79	0	46	4	47	66
Degree-days for September, 1935	19	95	0	67	10	33	80
Degree-days for September, Normal	0	39	0	0	0	0	0

	Peoria, Ill.	Philadelphia, Pa.	Pittsburgh, Pa.	Portland, Me.	Portland, Oreg.	Providence, R. I.	Reading, Pa.
Degree-days for September, 1936	58	37	48	187	81	107	59
Degree-days for September, 1935	94	41	64	182	28	102	83
Degree-days for September, Normal	3	0	0	120	105	63	0

	Richmond, Va.	Rochester, N. Y.	St. Louis, Mo.	Salt Lake City, Utah	San Francisco Calif.	Scranton, Pa.	Seattle, Wash.
Degree-days for September, 1936	13	106	31	105	104	90	165
Degree-days for September, 1935	27	171	38	38	161	152	98
Degree-days for September, Normal	0	72	0	18	114	60	192

	Spokane, Wash.	Syracuse, N. Y.	Toledo, Ohio	Trenton, N. J.	Utica, N. Y.	Washington, D. C.	Wichita, Kan.
Degree-days for September, 1936	185	120	85	52	126	26	59
Degree-days for September, 1935	99	183	114	74	225	40	35
Degree-days for September, Normal	192	96	9	0	182	0	0

To obtain unit fuel consumption figures for any city shown above, multiply the number of degree-days by the following factors: for coal, 0.008; for oil, 0.00069; for gas, 0.096. Figures obtained will show coal consumption in pounds per square foot of radiator surface; oil consumption in gallons per square foot; gas consumption in cubic feet per square foot—all for the period covered by the number of degree-days. The figures assume the use of steam radiators emitting 240 B.t.u. per sq. ft. per hr., a system operation at 100% efficiency, and radiators calculated for maintaining 70° in zero weather. Heating values assumed for the fuels are 12,000 B.t.u. per lb. for coal; 140,000 B.t.u. per gal. for oil, and 1,000 B.t.u. per cu. ft. for gas. To correct for other heating values, efficiency and design conditions, follow the method explained in the "HEATING & VENTILATING Degree-day Handbook" or on H. & V.'s Reference Data Sheet Nos. 67 and 68. Degree-days as given above for a "normal" month or season are based on averages for a long period of years, ending about 1922. Averages covering different periods will disagree with the above figures slightly.

Heater-Rust Ended...

FOR MONTGOMERY WARD & COMPANY

Storage heaters of non-rust EVERDUR *(Strengthened Copper)*, installed in their building at St. Paul, Minn., will provide clean hot water indefinitely...and cut overhead by eliminating rust-repairs

ADD another nationally-known name . . . that of Montgomery Ward & Company . . . to the growing list of owners of Everdur Metal storage heaters. In their St. Paul plant, an Everdur Metal heater has replaced a heater of rustable material which lasted for less than 7 years. And as this is written we learn that 3 similar Everdur heaters have just been ordered for installation in other Montgomery Ward & Company plants.

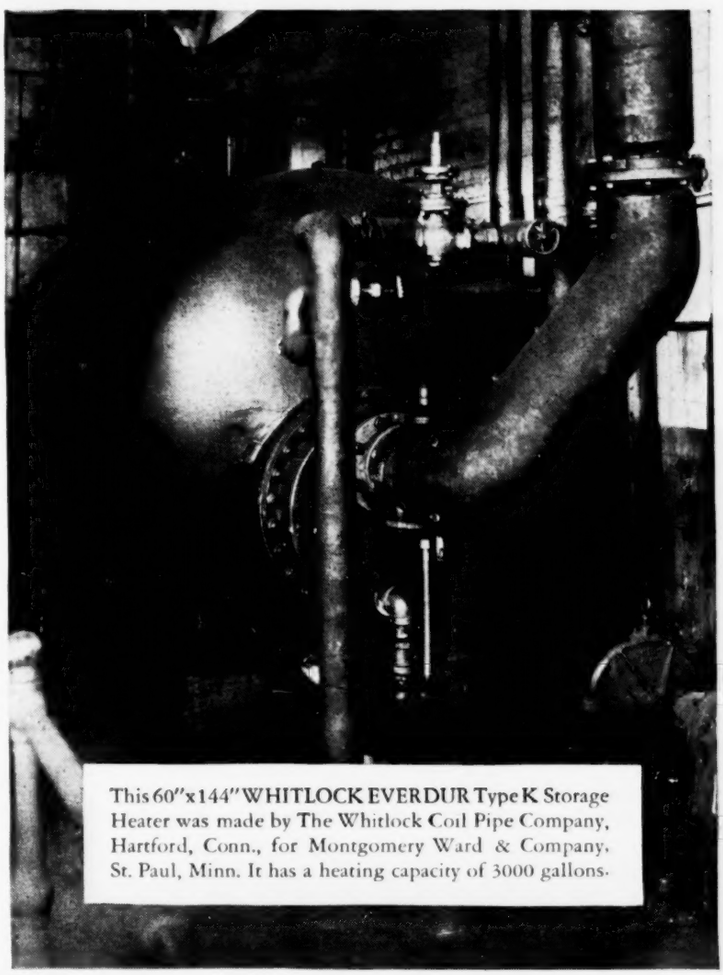
Clean hot water . . . no rust expense

Despite the fact that the St. Paul water is extremely corrosive, Montgomery Ward & Company can count on "lifetime" service from their Everdur Metal heater. Everdur is as rustless as copper and as strong as steel. And while serving dependably for years . . . heaters of Everdur also assure clean, rust-free water indefinitely . . . and reduce overhead by eliminating *all* repair and replacement expense due to rust.

Everdur is readily welded by all commonly used methods and fulfills every requirement for strong, durable heater shells. Obtainable from leading equipment manufacturers.

ANACONDA
from mine to consumer

36157



This 60"x144" WHITLOCK EVERDUR Type K Storage Heater was made by The Whitlock Coil Pipe Company, Hartford, Conn., for Montgomery Ward & Company, St. Paul, Minn. It has a heating capacity of 3000 gallons.

Everdur Metal for Tanks

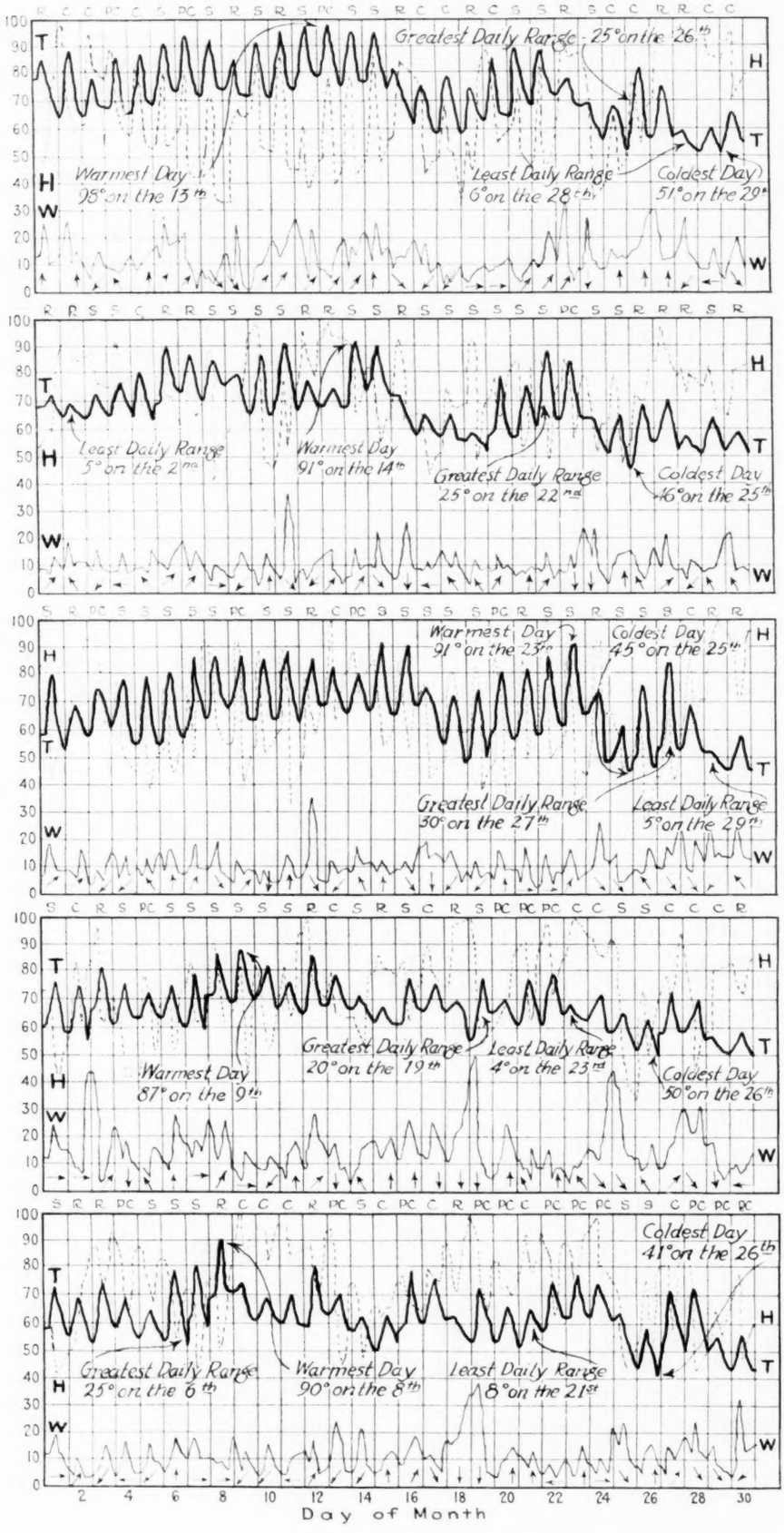
A COPPER ALLOY WITH THE STRENGTH OF STEEL

THE AMERICAN BRASS COMPANY, General Offices: WATERBURY, CONNECTICUT

Offices and Agencies in Principal Cities • In Canada: ANACONDA AMERICAN BRASS LTD., New Toronto, Ontario

THE WEATHER FOR SEPTEMBER, 1936

Plotted from records compiled for HEATING & VENTILATING by the U. S. Weather Bureau. Heavy curves (T), dry bulb temperatures in deg. F.; dotted lines (H), per cent relative humidity from readings at 8 a.m., noon, and 8 p.m. Light lines (W), wind velocity in m.p.h. Arrows indicate prevailing wind directions, north being arrow pointing up, etc.; S—clear; PC—partly cloudy; C—cloudy; R—rain; Sn—snow.


Greatest Daily Range 25° on the 26th
Warmest Day 95° on the 13th
Least Daily Range 6° on the 28th
Coldest Day 51° on the 29th
Least Daily Range 5° on the 2nd
Warmest Day 91° on the 14th
Greatest Daily Range 25° on the 22nd
Coldest Day 46° on the 25th
Warmest Day 91° on the 23rd
Coldest Day 45° on the 25th
Greatest Daily Range 30° on the 27th
Least Daily Range 5° on the 29th
Greatest Daily Range 20° on the 19th
Least Daily Range 4° on the 23rd
Warmest Day 87° on the 9th
Coldest Day 50° on the 26th
Coldest Day 41° on the 26th
Greatest Daily Range 25° on the 6th
Warmest Day 90° on the 8th
Least Daily Range 8° on the 21st
T
H
W
Day of Month

St. Louis

Mean temp. for month, 74.2F; aver. wind velocity, 11.1 m.p.h.; prevailing direction of wind, SW.

Chicago

Mean temp. for month, 68.2F; aver. wind velocity, 9.3 m.p.h.; prevailing direction of wind, S.

Pittsburgh

Mean temp. for month, 67.8F; aver. wind velocity, 9.4 m.p.h.; prevailing direction of wind, S.

New York

Mean temp. for month, 67.1F; aver. wind velocity, 12.6 m.p.h.; prevailing direction of wind, SE.

Boston

Mean temp. for month, 62.6F; aver. wind velocity, 9.8 m.p.h.; prevailing direction of wind, SW.

39 Million Feet of Experience goes into the Making of AEROFIN Heat-Exchange Surface

The thirty-nine million feet of standardized light-weight heating and cooling surface manufactured by Aerofin in the past 13 years, represents a specialized experience in dealing with one of the important phases of the heating, ventilating and air conditioning industry.

Step by step over the years, Aerofin has improved, refined and enlarged its line to keep pace with the growing and diversified needs of this great industry. Pioneer in the introduction of modern fin-type heat exchange surface, Aerofin has always kept ahead by anticipating the practical requirements of architects, consulting engineers and heating contractors.

Areofin remains ahead today for the same reason. Its work is the constant study of your problems, its aim, the development of a surface that meets the most rigorous specifications of your profession.

You will find everything that you have always wanted in a heating surface in Aerofin. Let Aerofin's home office or any of its branches study your needs. The prompt, personal, technical co-operation of its engineers is at your service.

AEROFIN is sold only by Manufacturers of Nationally Advertised Fan System Apparatus.

AEROFIN CORPORATION
850 Frelinghuysen Avenue
Newark, N.J.
Chicago Detroit New York Philadelphia

Lincoln Bank Tower, Fort Wayne, Ind.

CENTRAL HEAT CONTROL CUTS COAL CONSUMPTION

Webster Moderator System Saves $781 in Lincoln Bank Tower During '35-'36 Season

Uses "Control-by-the-Weather"

Fort Wayne, Ind.—The Lincoln Bank Tower, equipped when built in 1930 with a modern vacuum system of steam heating, was further improved during the summer of 1935 with a Webster pneumatic-type Moderator System of Central Heating Control.

This improved system reduced coal consumption 150 tons during the 1935-36 heating season, equivalent to a cash saving of $781.50.

During 1935-36, with the Webster Moderator System, the cost of heating the Lincoln Bank Tower was $2,349.71. The old system for a comparable number of degree days would have required a fuel expenditure of $3,131.21.

The effectiveness of the Webster Control is indicated in the following summary:

	Lbs. Coal Fired	*Degree Days*	*Lbs. Coal Per D.D.*
1934-35—Before Webster Control	1,073,520	6,046	177
1935-36—After Webster Control	902,000	6,792	132

Investigation of comparable buildings led the management of the Lincoln Tower to the conclusion that addition of Webster "Control-by-the-Weather," with accurately sized metering orifices and convenient manual supply valves, would afford increased flexibility and at the same time effect a modest saving.

The results of the first season's operation show the objectives fully achieved. Comfort has been increased and wasteful window opening reduced to a minimum.

Schwegman-Witte Co., of Fort Wayne, acted as heating contractors. The architects of the building, when it was constructed, were Walker and Weeks of Cleveland and A. M. Strauss of Fort Wayne.

The first step in every Webster Heating Modernization Program is a careful investigation of existing steam-using facilities. When ample opportunity for steam savings is found to exist, Webster engineers work closely with owners, architects and heating contractors until the installation is completed and operating at maximum efficiency.

The Lincoln Bank Tower is one of 70,000 installations in which Webster Heating Systems and Webster System Equipment are providing fuel savings, comfortable indoor temperatures, and minimum repair and maintenance bills.

If you are interested in heating new buildings, or in improved heating service and lower heating cost in your present building, address

Warren Webster & Company . . . Camden, N. J.
Pioneers of the Vacuum System of Steam Heating
Branches in 60 principal U. S. Cities . . . Darling Bros., Ltd., Montreal, Canada

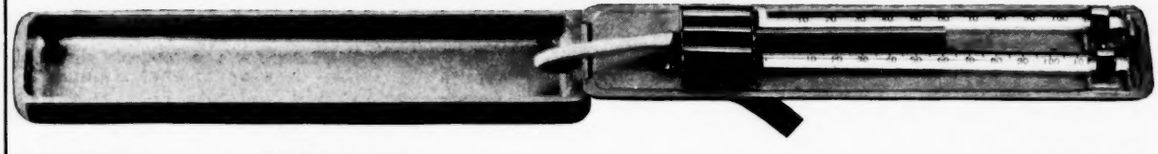
Preliminary Degree-Day Figures for October, 1936

The table below gives degree-day figures for October for 48 important cities. These figures are preliminary, based on wired reports, and will be followed in next month's issue by final figures. Final figures for September, 1936 appear on page 70.

Albany, N. Y.	367	Little Rock, Ark.	135
Atlanta, Ga.	94	Los Angeles, Calif.	23
Baltimore, Md.	183	Memphis, Tenn.	139
Birmingham, Ala.	72	Milwaukee, Wis.	465
Boston, Mass.	324	Minneapolis, Minn.	537
Buffalo, N. Y.	431	Nashville, Tenn.	145
Cheyenne, Wyo.	617	New Haven, Conn.	302
Chicago, Ill.	352	New Orleans, La.	12
Cincinnati, Ohio	276	New York, N. Y.	262
Cleveland, Ohio	335	Oklahoma City, Okla.	234
Columbus, Ohio	308	Omaha, Neb.	360
Denver, Colo.	449	Philadelphia, Pa.	206
Des Moines, Iowa	387	Pittsburgh, Pa.	304
Detroit, Mich.	415	Portland, Me.	426
Dodge City, Kan.	317	Portland, Oreg.	193
Duluth, Minn.	738	Richmond, Va.	148
El Paso, Tex.	103	St. Louis, Mo.	225
Erie, Pa.	370	Salt Lake City, Utah	345
Evansville, Ind.	202	San Francisco, Calif.	107
Fort Wayne, Ind.	365	Scranton, Pa.	367
Grand Rapids, Mich.	439	Seattle, Wash.	267
Harrisburg, Pa.	280	Spokane, Wash.	352
Indianapolis, Ind.	298	Washington, D. C.	184
Kansas City, Mo.	243	Wichita, Kan.	279

FRIEZ BALTIMORE

MEASURING HUMIDITY



Without Whirling . . .

Here's the New standard Instrument for measuring Humidity.

You don't have to whirl it. A hand operated bellows causes air to be drawn rapidly across the thermometer bulbs. You read the temperatures immediately before your eyes.

You can use it in crowded rooms, without anyone being inconvenienced.

Designed expressly for the needs of Air-Conditioning, one of the new and better devices that has given to the Friez organization the title of ***"Specialist in Air-Conditioning Controls and Instruments."***

PRICE AT BALTIMORE

$15

IN NEW BAKELITE CASE

Made exclusively by

JULIEN P. FRIEZ & SONS

INCORPORATED

"The Makers of America's Weather Instruments"

BALTIMORE, MARYLAND

FRIEZ BALTIMORE

WITH THE MANUFACTURERS

Air Controls, Inc., Div. The Cleveland Heater Co., Cleveland, has appointed **R. B. Leckie** to head its new products division. Mr. Leckie for the past eight years was professor of gas engineering at Purdue University.

The American Gas Products Corp., New York, has appointed **G. J. Kollock** as its representative in the southeastern territory. Mr. Kollock will make his headquarters at the Norris Building, Atlanta, Ga.

American Radiator Co., New York, recently opened its new Arco air filter plant at 1330 West Congress St., Chicago. A research and development laboratory under the direction of engineers is also included. The plant is designed to handle orders for special sizes and types of filters to meet the individual requirements of any air conditioning unit.

Hoffman Specialty Co., Stamford, Conn., has completed its testing and research laboratory where control and operating devices for radiator heating systems will be tested and air conditioning for radiator heated homes investigated. The purpose of the new laboratory is twofold—all Hoffman products will be tested and analyzed and present designs improved; second, new devices will be developed for steam heated, air conditioned systems. In one department equipment is provided which can produce a temperature differential of 100° between one side of a wall and the other. The operation of thermostatic controls can thus be observed under every conceivable variation between indoor and outdoor temperature.

The Mercoid Corp., Chicago, Ill., has announced its distributor in New York as The Mercoid Corp., Eastern Branch, 90 West St.

Public Service Heat & Power Co., Inc., 41-14 27th St., Long Island City, N. Y., New York and New Jersey distributor of the Newton Threeway automatic coal burner, has appointed **Dependable Fuel & Supply Co.,** Lynbrook, L. I., to take over the sale of this equipment under their supervision.

The Rawlplug Co., Inc., New York, has appointed **R. L. Langford** manager of its Minneapolis office, located at 536 Sexton Building.

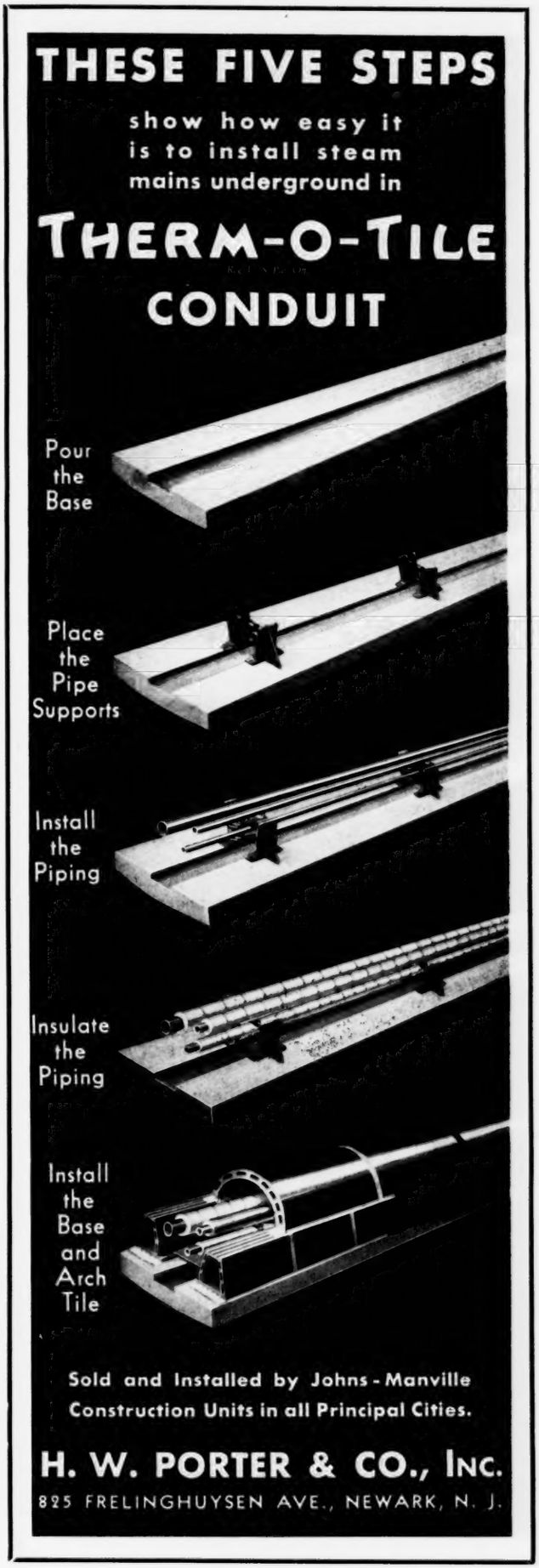
R. H. Sonneborn

Republic Steel Corp., Cleveland, Ohio, has appointed **R. H. Sonneborn** as assistant manager of sales of its pipe division. Mr. Sonneborn was formerly special representative. He was at one time associated with Colorado Fuel and Iron Co., later joining the sales department of Youngstown Sheet & Tube where he remained until coming to Republic in January, 1936. **Martin I. Shea** will continue as the other assistant manager of the Pipe Division.

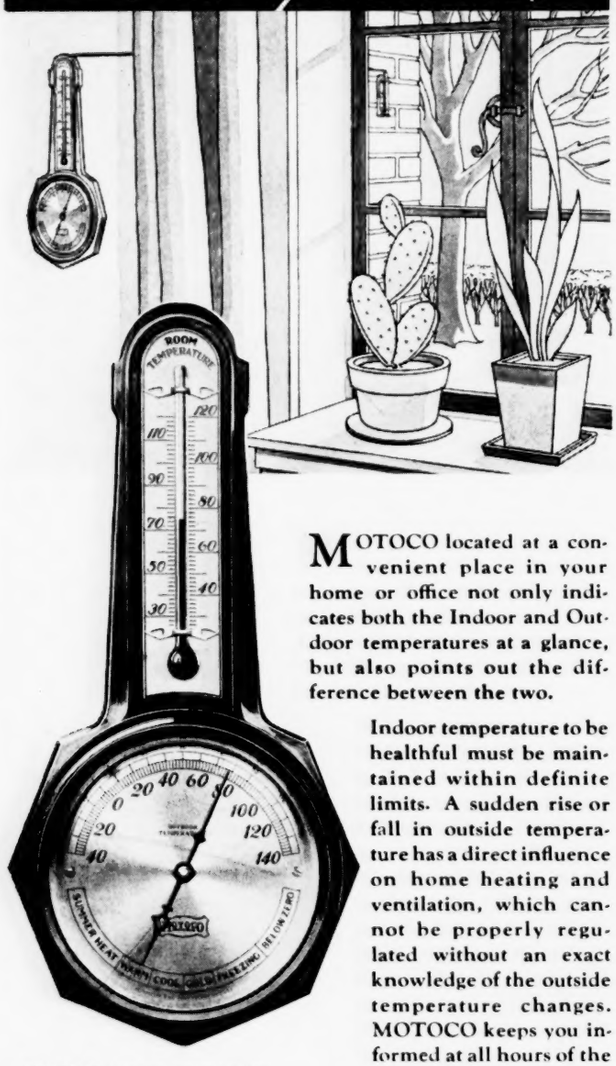
Sheffler-Gross Co., Inc., Drexel Bldg., Philadelphia, has appointed **Frank B. Conlon** as sales engineer.

The Turner Brass Works, Sycamore, Ill., has acquired a 143 x 102 ft., one-story brick building adjacent to its main plant and re-equipped it for office space and product development laboratories. Permanent displays of the company's equipment will be set up. The building has 15,000 sq. ft. of floor space.

E. O. Young Co., Cleveland, Ohio, announces that it is manufacturing and installing the air conditioning units in the first apartment building in Cleveland to be completely air conditioned. The building has 36 suites.


THESE FIVE STEPS
show how easy it is to install steam mains underground in
THERM-O-TILE CONDUIT
Pour the Base
Place the Pipe Supports
Install the Piping
Insulate the Piping
Install the Base and Arch Tile
Sold and Installed by Johns-Manville Construction Units in all Principal Cities.
H. W. PORTER & CO., INC.
825 FRELINGHUYSEN AVE., NEWARK, N. J.

INDOOR and OUTDOOR TEMPERATURE *at a Glance!*



MOTOCO located at a convenient place in your home or office not only indicates both the Indoor and Outdoor temperatures at a glance, but also points out the difference between the two.

Indoor temperature to be healthful must be maintained within definite limits. A sudden rise or fall in outside temperature has a direct influence on home heating and ventilation, which cannot be properly regulated without an exact knowledge of the outside temperature changes. MOTOCO keeps you informed at all hours of the day or night.

MOTOCO has an artistic silver finish dial and bevel crystal. It may be obtained in the following colors: maroon, walnut, black, green and ivory.

•

The Motoco line also includes Distance Reading Thermometers, Recording Thermometers, Pressure & Vacuum Gauges and Pressure & Vacuum Recorders for Industrial application.

•

A post card request will bring you complete details of Motoco precision instruments.

MOTOCO
INDOOR AND OUTDOOR
THERMOMETER
PRICE
$12.00

MOTO METER

THE ELECTRIC AUTO-LITE COMPANY
MOTO METER GAUGE & EQUIPMENT DIV.
CHRYSLER BUILDING · NEW YORK CITY, N.Y.

NEW CATALOGS

American Radiator Co., 40 West 40th St., New York, has published three new circulars covering various types of equipment which it offers. The first of these deals with Ideal Arco accessories such as steam gages, water gages, thermometers, expansion tanks, and boiler cleaners. The second describes the Arco oil furnace No. 11, while the third covers the Arco radiant convector. All of these bulletins are standard size.

Carbondale Machine Corp., Harrison, N. J. A standard-size, 16-page bulletin, No. 1104, describing the Carbondale line of absorption refrigeration equipment. This bulletin explains the absorption method of refrigerating and gives detailed information on the various units which this company offers. Three types of absorption machines, the Atmospheric, Double-Pipe, and Tubular are illustrated by line drawings. Photographs are used to show various parts of the absorption system.

Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, has published an attractive bulletin entitled Automatic Coal Burners by Fairbanks-Morse. This bulletin is of standard-size and has 24 pages. It describes the company's complete line of domestic and industrial stokers. Detailed descriptions of their various features are also included.

National Air Conditioning Incorporated, Div. National Radiator Corp., 101 Park Ave., New York, has published a standard-size, 12-page bulletin entitled There Is No Place Like The National Air Conditioned Home. This catalog discusses the functions of air conditioning equipment and describes the construction, operation, and installation of its Packaged Weather units for conditioning homes and small buildings. Includes typical installation plans and recommendations for estimating the size and type of units, ducts, registers, radiator surface, and boiler size.

Worthington Pump and Machinery Corp., Harrison, N. J., has published a four-page, standard-size catalog on the Worthington horizontal simplex air and steam heating vacuum pumps. Includes data on sizes and capacities and mentions the more important features of the pumps.

Young Regulator Co., 4500 Euclid Ave., Cleveland, Ohio. A standard-size, four-page bulletin on the Young regulator. Includes sketches and installation data.

COMING EVENTS

NOVEMBER 11-13, 1936. THIRD ANNUAL CONVENTION OF THE REFRIGERATION SERVICE ENGINEERS' SOCIETY, *Hotel Gayoso, Memphis, Tenn.*

NOVEMBER 30-DECEMBER 4, 1936. FIFTY-THIRD ANNUAL MEETING OF THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS, *Engineering Societies Bldg., New York.*

NOVEMBER 30-DECEMBER 5, 1936. 12TH NATIONAL EXPOSITION OF POWER AND MECHANICAL ENGINEERING, *Grand Central Palace, New York.*

DECEMBER 2-4, 1936. 32ND ANNUAL CONVENTION OF THE AMERICAN SOCIETY OF REFRIGERATING ENGINEERS, *Hotel Pennsylvania, New York.*

DECEMBER 10-11, 1936. 12TH ANNUAL CONFERENCE ON WELDING, *Purdue University, Lafayette, Ind.*

DECEMBER 15-17, 1936. WINTER MEETING OF THE NATIONAL WARM AIR HEATING AND AIR CONDITIONING ASSOCIATION, *Stevens Hotel, Chicago, Ill.*

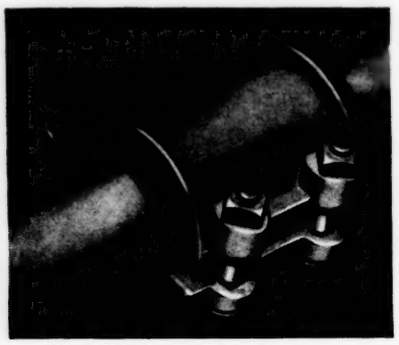
JANUARY 25-27, 1937. 43RD ANNUAL MEETING OF THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS, *St. Louis, Mo.*

MARCH 15-19, 1937. NATIONAL OIL BURNER AND AIR CONDITIONING EXPOSITION, *Municipal Auditorium, Philadelphia. Sponsored by the Oil Burner Institute, New York.*

Skinner Pipe Clamps

NAME—Skinner pipe clamp.

PURPOSE—A pipe clamp for stopping leaks in pipes.



FEATURES—All clamps except those for use on high pressure lines, can be installed while lines are in service. Clamps are hinged on one side for ease in installation. They are enamelled and equipped with cadmium-plated steel bolts and rubber gaskets.

SIZES—Available for stopping leaks in all types of pipe lines, either high or low pressure.

MADE BY—*M. B. Skinner Co., 3774 W. Sample St., South Bend, Ind.*

Hill Air Conditioner

NAME AND MODEL NUMBER—Hill Air Conditioner and Heat Saver.

PURPOSE—To supply warmed and humidified air, utilizing the heat in the flue gas from the boiler.

METHOD OF OPERATION—The unit is much like a tube pipe boiler with the hot flue gases passing through the tubes. It is installed between the boiler and the chimney. The lower tubes in the heat saver are covered with water while the upper tubes have air passing over them. The air enters the heat saver just over the surface of the water and carries the moisture to the rooms together with the hot air. A float valve connected to the water supply system maintains the water level in the heat saver.

MADE BY—*Frank M. Hill Machine Co., 50 School St., Walpole, Mass.*

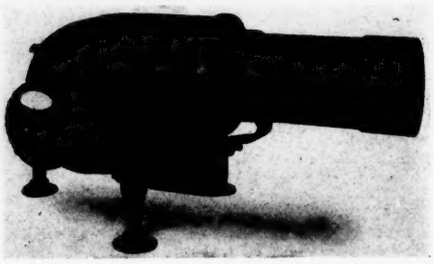
Fluid Heat Burners

NAME AND MODEL NUMBER — Fluid Heat pressure type oil burners, models P-6A, P-9A, and P-12A.

FEATURES—Burners have an air regulation device on the discharge side of the fan. This principle has been used on previous models for the last two years. The P-6A model has intermittent ignition and the P-9A and P-12A have constant ignition.

CAPACITIES — Maximum nozzle capacities 6, 9, and 12 gal. per hr., respectively.

MADE BY—*Fluid Heat Div., Anchor Post Fence Co., Eastern Ave. & Kane St., Baltimore, Md.*



Poggel Catchdew Dehumidifier

NAME—Poggel Catchdew dehumidifier.

PURPOSE—For removing excess moisture from room air.

METHOD OF OPERATION—These units are designed for use in rooms such as printing press rooms where it is desired to lower the relative humidity. The manufacturer claims that excess moisture is absorbed from the air by electro-chemical action. The units are designed to be suspended from the ceiling and operated on either a.c. or d.c. current, 110 volts. Manufacturer states that each unit is capable of taking care of 800 sq. ft. of floor area.

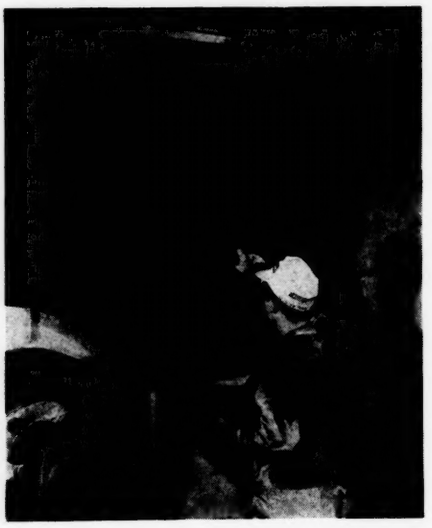
MADE BY—*Advance Manufacturing Co., Inc., Louisville, Ky.*

Eagle Plastic Insulation

NAME AND MODEL NUMBER—The Eagle Super 66 plastic insulation.

PURPOSE—A plastic insulation for use on practically any form of heat producing or transferring equipment with surface temperatures as high as 1,800F.

FEATURES — Insulation can be applied on either hot or cold surfaces and the manufacturer states that its strong adhesiveness makes it especially useful for insulated irregular



pieces. It is installed by mixing the material with water, spotting it on the surface, and then trowelling it to a smooth finish. It can be removed, remixed, and used over again when subjected to temperatures up to 1,200F.

COVERAGE—60 sq. ft., 1 in. thick per 100 lb.

MADE BY — *The Eagle-Picher Sales Co., Temple Bar Bldg., Cincinnati, Ohio.*

Westinghouse Midget Switch

NAME AND MODEL NUMBER—General purpose type D safety switch.

PURPOSE—For use on oil burners and other applications where midget switches are desired.

FEATURES — The switches are extremely small in size, and are said to be sturdy in construction and pleasing in appearance. It is claimed that front operation and compact design make their use possible in many places where side operating switches cannot be used. The cover may be sealed and provisions made for locking switch in off position.

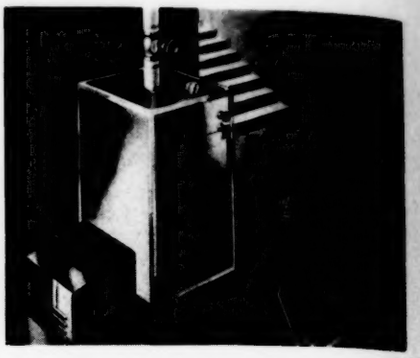
TYPES AVAILABLE—Two pole NEC and plug fuse types, also two and three pole solid neutral.

MADE BY—*Westinghouse Electric and Mfg. Co., East Pittsburgh, Pa.*

Anchor Bin Feed Kolstoker

NAME—Anchor bin feed Kolstoker.

PURPOSE — A stoker which automatically feeds the coal from the bin to the burner.



FEATURES—Stoker is furnished in either draw conveyor or drive conveyor type. In the draw conveyor type the screw draws the coal from the bin and conveys it under the floor through a feed tube to the burner. A reverse screw arrests the movement of the coal toward the stoker power unit and forces it up through the burner to the fire. In the drive conveyor type, the power unit of the stoker drives or pushes the coal from the bin to the boiler instead of drawing it as in the draw conveyor type. In this case, the stoker power unit is located behind the bin. The illustration shows a bin feed draw conveyor type.

MADE BY—*Anchor Stove and Range Co., New Albany, Ind.*

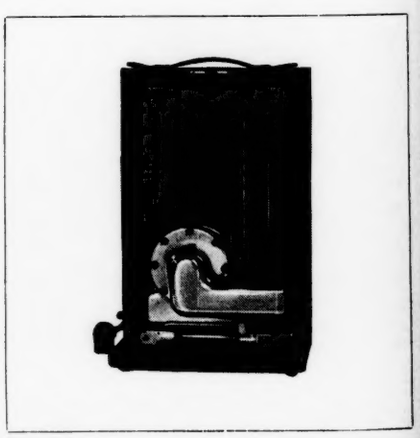
H-B Aspirating Psychrometer

NAME—H-B aspirating psychrometer.

PURPOSE—To indicate the amount of humidity in the air.

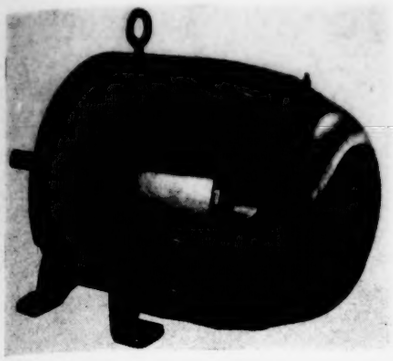
FEATURES — The manufacturer states that accurate readings can be obtained in one minute. Psychrometer can be obtained in either of two portable types; one a self-contained battery type, and the other a plug-in type operating on 110 volts, a.c. Both models employ the aspirating principle of drawing air at the proper velocity by a motor-driven fan across the sensitive mercury bulbs of two thermometers which are suspended in the air stream. The thermometers are calibrated in single degrees and are placed near the end of the intake sleeve, the incoming air passing first over the dry bulb and then over the wet bulb. A table for computing relative humidity and pocket slide rule for determining direct reading relative humidity are furnished with each instrument.

MADE BY—*H-B Instrument Co., 2518 N. Broad St., Philadelphia, Pa.*



Westinghouse Fan Cooled Motors

NAME—Type SK explosion-tested, fan-cooled, direct d.c. motors.



PURPOSE—For use in locations where explosive gases or dust may exist.

FEATURES—These motors are designed to withstand an internal explosion of gas or coal dust without injury to the equipment and without emitting flames or sparks which would ignite surrounding gas. A fan on the commutator end forces a large volume of cooling air through air passages in the motor.

SIZES AND CAPACITIES—5 to 75 hp. with 115, 230, and 550 volts.

MADE BY—*Westinghouse Electric and Mfg. Co., East Pittsburgh, Pa.*

Davies Airplex Filters

NAME—Davies Airplex dry air filters.

PURPOSE—Cleaning air.

FEATURES—Filter medium of the Airplex is a specially processed cotton, lightly glazed on both sides to prevent disintegration. Each unit contains about 30 sq. ft. of this filter medium. Large surface is obtained by folding the material into 4-in. pleats forty-two times inside the cartridge or box. It is said that the filtering material is not affected by humidity. Filters are serviced by replacing the complete cartridge after it accumulates its maximum load of dust which, under average operating conditions, occurs every two to three months. For special applications, manufacturer can supply a filter medium which is chemically treated so that it is fire retarding and will only char in contact with a flame.

SIZES AND CAPACITIES—Normal rating is 800 c.f.m. per unit with an initial resistance of 0.18 in. of water. The standard size is 20 x 20 x 4 in. 22 x 20 x 2 in. and 16 x 25 x 2 in. sizes are also available.

MADE BY—*Davies Air Filter Corp., 390 Fourth Ave., New York.*

Timken Pressure Burner

NAME AND MODEL NUMBER — Timken Silent Automatic pressure burner, model GH.

FEATURES—Burner consists of a 1/6-hp. split-phase motor, directly connected to the blower and oil pumps by means of a flexible coupling. Oil pump is equipped with dual strainers and the transformer has an interference eliminator. A propeller-like, four-bladed turbulator located in the air tube just back of the oil nozzle is said to increase the combustion efficiency. Burner is finished in black or green.

SIZES AND CAPACITIES—5½ to 10 g.p.h. and approximately 3,600 sq. ft. of e.d.r.

MADE BY—*Timken Silent Automatic Div., Timken-Detroit Axle Co., 100 Clark Ave., Detroit, Mich.*

Gar Wood Air-Duct System

NAME—Gar Wood air-duct system.

PURPOSE—A predesigned air-duct system for automatic heating and air conditioning.

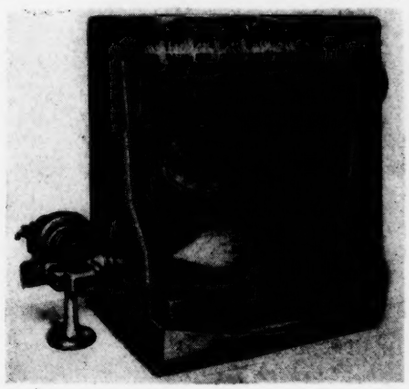
FEATURES—The duct system is composed of predesigned stock parts. Runouts from the trunk lines to the grilles are limited to four sizes, all a single depth to fit a standard of 2 in. x 4 in. partitions. Sizes are maintained for the entire run without transformation. It is said that because of a newly developed method of trunk design, the number of stock parts required has been reduced to one standard sized panel for each depth and if a single depth trunk is used there is only one part employed.

MADE BY—*Gar Wood Industries, Inc., Detroit, Mich.*

Pierce Oil-Burning Boiler

NAME AND MODEL NUMBER—Pierce Oil No. 2.

PURPOSE—For supplying steam or hot water to systems having no more than 3,000 sq. ft. of steam radiator surface, utilizing oil as a fuel.



FEATURES—Boiler is specifically designed for oil burning and has a 5-way heat travel together with a firing chamber, which is completely surrounded by water.

SIZES—For systems having up to 3,000 sq. ft. of steam radiator surface.

MADE BY—*Pierce Butler Radiator Corp., Syracuse, N. Y.*

Whitney Clip Punch

NAME—Whitney Clip punch.

PURPOSE — A tool for joining sheet metal in the construction of ducts.

METHOD OF OPERATION — The tool punches out a triangular "ear" in the seam, this ear then being folded back by hand to form a secure fastening with a three-way lock.

FEATURES—The punch has a capacity of two thicknesses of 16-gage metal and is so constructed that it can be used in narrow places. The jaws and handles are of drop forged steel with hardened pins.

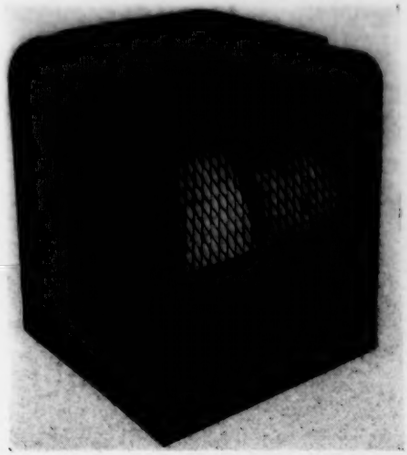
MADE BY—*The Whitney Metal Tool Co., Rockford, Ill.*

Schwitzer-Cummins Blower Unit

NAME—Hy-Duty blower-filter unit.

PURPOSE—For use with a warm air furnace for supplying forced and filtered air.

FEATURES—The blower is a 14-in. Hy-Duty type mounted on self-oiling and self-aligning bearings. Unit is made of heavy gage rust-



resisting steel; has ¼-hp. drive motor, and is equipped with an overload production. Unit is guaranteed for two years.

MADE BY—*Schwitzer-Cummins Co., Massachusetts Ave. and Fan St., Indianapolis, Ind.*

Guardian Gas Furnace

NAME AND MODEL NUMBER—Guardian floor furnace, Nos. F-35 and F-70.

PURPOSE—To supply heat to buildings not having basements, utilizing gas as a fuel.

FEATURES—This is a gas-fired, warm-air furnace which is designed to heat residences, lodges, hotels, or stores which do not have basements. The furnace has a one-piece combustion chamber which is sealed at all joints to prevent the flue gases from reaching any part of the living quarters.

CAPACITIES—35,000 and 70,000 B.t.u. per hr., respectively.

MADE BY—*Guardian Appliances, Inc., East 47 & St. Clair Ave., Cleveland, Ohio.*

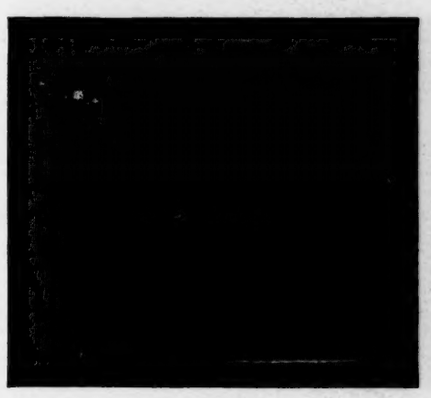
Roto Combustion Chamber

NAME—Roto combustion chamber.

PURPOSE—A combustion chamber for gun type oil burners.

FEATURES—Combustion chamber is made up of refractory insulating materials and comes ready to install with no cementing necessary. Manufacturer claims that it fits all type gun burners and can easily be installed in any furnace or boiler. It is said that the surface temperature of the combustion chamber reaches a high degree soon after the burner starts and thus results in a maximum efficiency.

MADE BY—*The Rex Clay Products Co., 14400 Dexter Blvd., Detroit, Mich.*



Final Degree-Day Figures for September, 1936

With this issue HEATING & VENTILATING begins its ninth year of publishing degree-day data for various large cities. The figures on this page are the final ones for September, 1936, while the preliminary figures for October, 1936, appear on page 74

	Albany, N. Y.	Atlanta, Ga.	Baltimore, Md.	Birmingham, Ala.	Boston, Mass.	Buffalo, N. Y.	Burlington, Vt.
Degree-days for September, 1936.....	110	0	28	0	122	122	217
Degree-days for September, 1935.....	167	3	36	0	126	176	261
Degree-days for September, Normal...	72	0	0	0	48	75	144

	Cheyenne, Wyo.	Chicago, Ill.	Cincinnati, Ohio	Cleveland, Ohio	Columbus, Ohio	Denver, Colo.	Des Moines, Iowa
Degree-days for September, 1936.....	216	63	49	77	53	148	62
Degree-days for September, 1935.....	227	94	59	94	59	144	87
Degree-days for September, Normal...	240	3	0	27	0	72	0

	Detroit, Mich.	Dodge City, Kan.	Duluth, Minn.	El Paso, Tex.	Erie, Pa.	Evansville, Ind.	Fort Wayne, Ind.
Degree-days for September, 1936.....	105	93	221	36	86	18	83
Degree-days for September, 1935.....	144	69	366	16	120	25	102
Degree-days for September, Normal...	42	0	261	0	36	0	0

	Grand Rapids, Mich.	Harrisburg, Pa.	Hartford, Conn.	Indianapolis, Ind.	Kansas City, Mo.	La Crosse, Wis.	Lincoln, Neb.
Degree-days for September, 1936.....	111	52	100	61	51	105	66
Degree-days for September, 1935.....	140	79	127	61	47	145	76
Degree-days for September, Normal...	57	0	48	0	0	96	0

	Little Rock, Ark.	Los Angeles, Calif.	Louisville, Ky.	Madison, Wis.	Memphis, Tenn.	Milwaukee, Wis.	Minneapolis, Minn.
Degree-days for September, 1936.....	3	0	25	111	1	89	92
Degree-days for September, 1935.....	13	0	33	133	17	107	153
Degree-days for September, Normal...	0	0	0	87	0	84	93

	Nashville, Tenn.	New Haven, Conn.	New Orleans, La.	New York, N. Y.	Norfolk, Va.	Oklahoma City, Okla.	Omaha, Neb.
Degree-days for September, 1936.....	1	79	0	46	4	47	66
Degree-days for September, 1935.....	19	95	0	67	10	33	80
Degree-days for September, Normal...	0	39	0	0	0	0	0

	Peoria, Ill.	Philadelphia, Pa.	Pittsburgh, Pa.	Portland, Me.	Portland, Oreg.	Providence, R. I.	Reading, Pa.
Degree-days for September, 1936.....	58	37	48	187	81	107	59
Degree-days for September, 1935.....	94	41	64	182	28	102	83
Degree-days for September, Normal...	3	0	0	120	105	63	0

	Richmond, Va.	Rochester, N. Y.	St. Louis, Mo.	Salt Lake City, Utah	San Francisco Calif.	Scranton, Pa.	Seattle, Wash.
Degree-days for September, 1936.....	13	106	31	105	104	90	165
Degree-days for September, 1935.....	27	171	38	38	161	152	98
Degree-days for September, Normal...	0	72	0	18	114	60	192

	Spokane, Wash.	Syracuse, N. Y.	Toledo, Ohio	Trenton, N. J.	Utica, N. Y.	Washington, D. C.	Wichita, Kan.
Degree-days for September, 1936.....	185	120	85	52	126	26	59
Degree-days for September, 1935.....	99	183	114	74	225	40	35
Degree-days for September, Normal...	192	96	9	0	182	0	0

To obtain unit fuel consumption figures for any city shown above, multiply the number of degree-days by the following factors: for coal, 0.008; for oil, 0.00069; for gas, 0.096. Figures obtained will show coal consumption in pounds per square foot of radiator surface; oil consumption in gallons per square foot; gas consumption in cubic feet per square foot—all for the period covered by the number of degree-days. The figures assume the use of steam radiators emitting 240 B.t.u. per sq. ft. per hr.. a system operation at 100% efficiency, and radiators calculated for maintaining 70° in zero weather. Heating values assumed for the fuels are 12,000 B.t.u. per lb. for coal; 140,000 B.t.u. per gal. for oil, and 1,000 B.t.u. per cu. ft. for gas. To correct for other heating values, efficiency and design conditions, follow the method explained in the "HEATING & VENTILATING Degree-day Handbook" or on H. & V.'s Reference Data Sheet Nos. 67 and 68. Degree-days as given above for a "normal" month or season are based on averages for a long period of years, ending about 1922. Averages covering different periods will disagree with the above figures slightly.